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Certification of SRM 2492: Bingham Paste Mixture for Rheological Measurements

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Abstract

Rheological measurements are often performed using a rotational rheometer. In this type of rheometer, the tested fluid is sheared between two surfaces, one of which is rotating [1]. Usually, the angular velocity is imposed and the response of the material is monitored by the measurement of the torque. The manufacturers recommend the use of a standard oil of known viscosity to verify that the instrument is operating correctly.

Because these oils are expensive, however, they cannot be used for the large volumes employed in concrete rheometers. Therefore, a relatively inexpensive, accurate reference material is needed that incorporates aggregates for concrete rheometers. As concrete and mortar are non-Newtonian, the reference material should also be non-Newtonian. The development of this new Standard Reference Material (SRM) is based on a multiphase approach. This report is the description of the development and certification of a paste SRM. Based on this SRM, further SRMs for mortar and concrete will be developed in the future.

The purpose of this report is to describe the process to certify SRM 2492, a "Bingham Paste Mixture for Rheological Measurements". All measurements used for the development of the rheological characteristics are provided along with statistical analyses.

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1 Introduction

A National Institute of Standards and Technology (NIST) Standard Reference Material® (SRM) meets specific certification criteria and is issued with a certificate of analysis that reports the results of its characterization and provides information regarding the appropriate use(s) of the material. An SRM is prepared and used for three main purposes: 1) to help develop accurate methods of analysis; 2) to calibrate measurements systems used to facilitate exchange of goods, institute quality control, determine performance characteristics, or measure a property at the state-of-art limit; and 3) to ensure the long-term adequacy and integrity of measurement quality assurance programs. The National Institute of Standards and Technology (NIST) provides over 1300 different SRMs to industry and academia. Every NIST SRM is provided with a certificate of analysis that gives the official characterization of the material's properties. In addition, supplementary documentation, such as this report, describing the development, analysis, and use of SRMs, is also often provided to ensure effective use of these materials.

There are several SRMs related to the cement industry but none is related to the rheological properties of cement paste, mortar or concrete. After completing two international inter-laboratory studies related to rheological properties measurements of concrete, it was determined that the use of expensive oils was not suitable for calibration of concrete rheometers. Thus, a need exists for a granular reference material specifically designed for concrete was requested by the industry. SRM 2492, the first step for concrete rheological SRM, is a two-component fluid having Bingham characteristics. The operator needs to mix the two components with water in the proportions provided in the certificate. Once mixed the material shelf life of the mixture is 7 d. The values given in this report were obtained through testing performed at NIST using a serrated parallel plate rheometer.

The objective of this report is to describe the SRM 2492 and its rheological properties. A brief description of the methodology and all measurements used are provided along with the statistical analysis.

2 Description of Rheological Measurements

2.1 Introduction

Rheological measurements are commonly performed using a rotational rheometer. In this type of rheometer, the test fluid is sheared between two surfaces, one of which is rotating while the other is stationary [1]. The rate of the rotating surface is precisely controlled by a computer, while measuring the torque resulting from the material response. Laboratory rheometers are mainly designed for homogeneous liquids, such as oils, containing no particles, such as oils. The manufacturers recommend the use of a standard oil of known viscosity to verify that the instrument is operating correctly. The kinematic viscosities are determined by reference to the water viscosity established by international consensus in 1953 [2], as described in ISO-3666 (International Organization for Standardization) [3]. In 1954, NIST [2] conducted a study to compare two rheological techniques, the Bingham viscometer and the Cannon Master viscometer (both based on capillary flow) that are still used today for determining the viscosity values of standard oils.

Because these oils are expensive, it is not economically practical to use them due to the large volumes of oil needed in concrete rheometers. Some concrete rheometers have used a less expensive oil with a known viscosity to calibrate a concrete rheometer. For example, in 2003, a high viscosity polydimethylsiloxane fluid (with a NIST measured viscosity of 29.5 Pa·s ± 0.6 Pa·s at 24.4 °C ± 0.4 °C), was used in concrete rheometers [4] during an international round robin. It was shown that not all rheometers were able to measure the oil rheological properties, due to their specific shear patterns and slippage or lack of it on the shearing surfaces. In the case of fresh concrete, the geometry of the rheometer needs to allow the distance between the shearing surfaces to be sufficiently large to accommodate aggregates of at least 25 mm in diameter. The increase in size leads to generally unknown shear patterns and test results that cannot quantitatively characterized in fundamental units. Therefore, calibration of such large and non-standard rheometers is impossible using the traditional measurement protocol involving. It should be stated that any two concrete rheometers were found to be linearly correlated [4, 5, 6].

Thus current research has established the need for a new reference material for calibrating concrete rheometers. Concrete is a non-Newtonian suspension, thus any reference material mixture must be a non-Newtonian suspension. Ideally such a material must be inexpensive, reproducible and repeatable with respect of both its physical and chemical properties, and readily allow the inclusion of aggregates, similar as used in concrete. Given the constraints, the new strategy was to develop a granular mixture similar to concrete. American Concrete Institute (ACI) Committee 238 on Workability of Fresh Concrete, considered this approach and recommended the use of an oil of known viscosity in which particles could be added. The calculation of the viscosity of the mixture would be a combination of experimental measurements and computerized modeling. Thus, spherical particles would simplify the computerized model. Moreover, the particle specific gravity should match that of the oil to avoid sedimentation during testing as the medium has no yield stress. Given these constraints, hollow plastic spheres were an excellent candidate material. Unfortunately, their cost is prohibitive. Therefore,

this idea was deemed impractical and thus, was abandoned as a viable strategy. Instead, a multiscale approach was considered to be the next best option.

The multiscale approach consists of developing a paste, followed by a well-characterized mortar and the well-characterized concrete. A mortar is produced by adding sand to the paste while, a concrete is produced by adding coarse aggregates to this mortar. The rheological parameters of the mortar and concrete would be determined from the paste through a combination of measurements and computer simulation. The simulation is designed to calculate the viscosity of the suspensions (mortar or concrete) from the medium viscosity (cement paste) with various aggregate concentrations, aggregate size distribution, and particle shape.

A non-Newtonian reference material for cement paste should have the following characteristics: 1) no particle segregation for the duration of the test; 2) linear Bingham stress response to shear rates over a large range; 3) rheological and chemical properties unchanged over at least several days, with no chemical reactions between the medium and the particles; 4) a yield stress sufficient to avoid segregation of added sand and coarse aggregates; and 5) the linear response should be reversible, implying no structural breakdown or build-up, flocculation or deflocculation during the test, i.e., no hysteresis.

2.2 Rheological parameters

The primary output of rheological measurements is either a shear stress-shear rate plot or a plot of the rotational speed of the rotating surface versus the torque. In cases where the geometry of the rheometer does not permit a direct calculation of the shear stress and shear rate in fundamental units, the rotational speed is plotted against torque [6].

The viscosity [1] is defined as the ratio of the shear stress over the shear rate at a given shear rate. For a Newtonian fluid, the viscosity is the slope of the linear fitted line of the shear stress-shear rate plot, passing through zero. Most granular mixtures are non-Newtonian, however. Non-Newtonian mixtures exhibit a yield stress, which is the stress needed to initiate deformation or flow of the material. This yield stress can be measured in several ways. The most common method is the extrapolation from the Bingham test method [9, 10].

The Bingham equation (Eq. (1)) is used in determining the plastic viscosity and the yield stress. This procedure implies that the plastic viscosity η_{pl} is defined as the slope of the shear stress versus shear rate curve and the yield stress τ_B is the intercept of the curve at zero shear rate. This point is generally not measured so this constitutes an extrapolation (Figure 1). The Bingham rheological parameters, yield stress and plastic viscosity, will characterize the flow curve within a range of shear rates, as shown in Figure 3 and equation [1].

$$\tau = \tau_B + \eta_{pl}\dot{\gamma} \qquad \textbf{[1]}$$

where σ= shear stress, σ_B = yield stress, η_{pl} = plastic viscosity, and $\dot{\gamma}$ = shear rate.

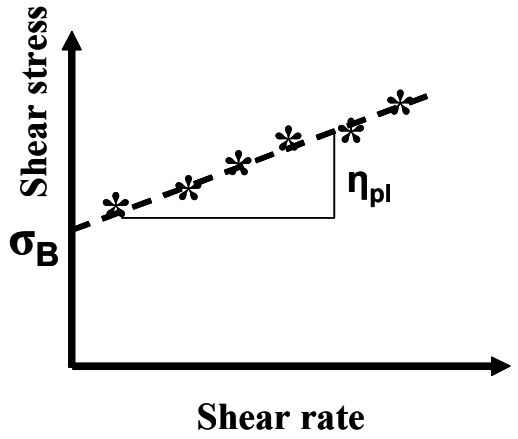


Figure 1: Bingham model and calculation of the plastic viscosity and yield stress.

2.3 Experimental Set-up

Conventional rotational rheometers often have different geometries. Nevertheless, the principle always involves two surfaces shearing the material [1]. The geometry used in this report is serrated parallel plates as shown in Figure 2. The plates were 35 mm in diameter. Figure 2A shows the actual plates while Figure 2B shows a schematic of a parallel plate rheometer. To shear a granular material, precautions need to be taken to avoid slippage of the shearing surface. The device used had serrated surfaces as shown in Figure 2C. As this SRM contains water, precautions also need to be taken to avoid evaporation during the measurement. This is achieved by creating a small enclosure around the shearing plates as shown in Figure 2D. Finally, a wet sponge was placed in the enclosure to maintain a high relative humidity environment.

The gap between the two parallel plates was 0.600 mm ± 0.001 mm. A smaller gap could cause the particles to jam while a larger gap might lead to the material not staying between the plates. The temperature of the rheometer was maintained at 23 °C ± 0.5 °C during all tests.

In the rheometer used the rotational speed is controlled and the torque is measured. The computer software calculates automatically the shear rate and the shear stress from the rotational speed and the measured torque. The shear rate is calculated as follows:

$$\dot{\gamma}_R = \frac{R}{h} \cdot 2\pi \cdot n \qquad \textbf{[2]}$$

where: $\dot{\gamma}_R$ = shear rate at the outer edge [1/s]
R = radius of shear [mm] (17.5 mm in our case)
h = gap or distance between the plates [mm] (0.600 mm ± 0.001 mm)
n = speed of rotation of the top plate, revolution/s [1/s]

The shear stress calculation from the torque is [7]

$$\tau = \frac{T}{2 \cdot \pi \cdot R^3}\left(3 + \frac{d \ln T}{d \ln \dot{\gamma}_R}\right) \quad \textbf{[3]}$$

where τ = shear stress [Pa]
T = torque at the outer edge [N.m]
R = radius of shear [mm] (17.5 mm in our case)
$\dot{\gamma}_R$ = shear rate [1/s]

For Newtonian liquids the factor $d \ln T / d \ln \dot{\gamma}_R$ is equal to 1. In our case, it was estimated to be 0.84 leading to an error of about 4 % (less than the uncertainty due to other factors). It was decided to use the Newtonian approximation to simplify calculations. Therefore, the equation used was:

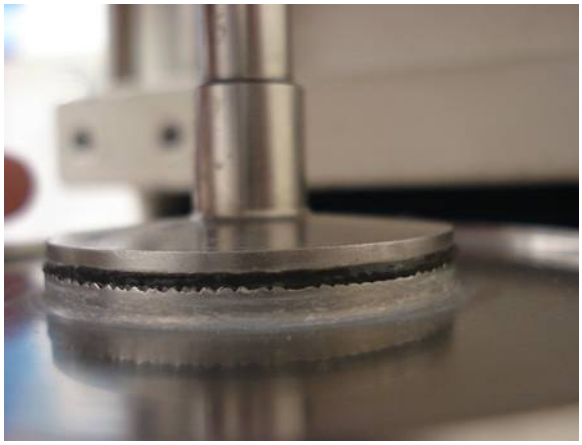
$$\tau = \frac{2 \cdot T}{\pi \cdot R^3} \quad \textbf{[4]}$$

A more accurate rheological error assessment, including the correction of the zeroing of the plates requires a standard oil. The measurement protocol for making these assessments is described in Section 5.

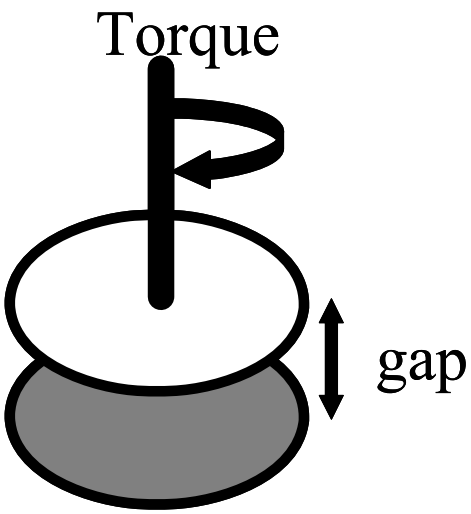
After calculating of the shear rate and shear stress from the torque and angular velocity, these values were corrected for plate roughness and zeroing error (due to the instrument) as outlined by Ferraris et al. [8]. This correction consists of modifying the gap by 0.27 mm [9, 10]. Further details on the uncertainty of the method can be found in ref. [8].

A measured volume of 1.3 mL of material was placed in the rheometer and the gap adjusted to 0.6 mm. Then the material was nominally sheared at 0.01 s^{-1} for 150 s before starting the Bingham test. The Bingham test consisted in increasing the nominal shear rates from 0.1 s^{-1} to 50 s^{-1} (10 points) and then decreasing shear rate from 50 s^{-1} to 0.1 s^{-1} (20 points). At each point the shear rate was maintained at the desired value until equilibrium of the torque was reached, but for a time not to exceed 30 s.

The hysteresis (Pa/s) was defined as the area between the up (increasing shear rate) and down (decreasing shear rates) curves of shear stress vs. shear rate.



A



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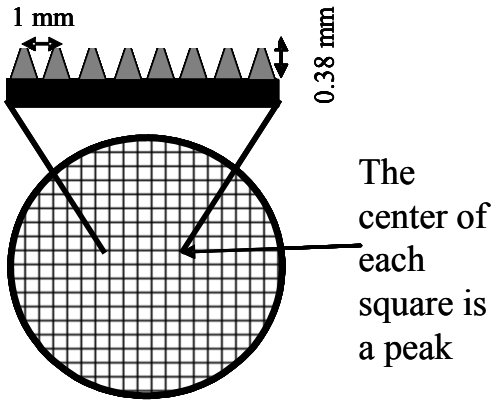

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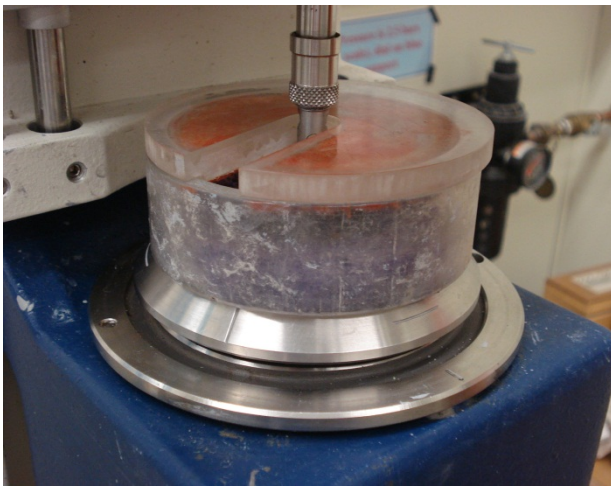

D

Figure 2: Parallel plate rheometer

3 Materials

3.1 Characteristics of the Limestone and Corn Syrup

Preliminary tests were conducted on samples of the corn syrup from another batch of material used for this SRM. According to the manufacturer, the material is a pure corn syrup with no additives. Its density measured at NIST was 1436 kg/m^3 ± 5 kg/m^3, with a water content of 18.6 % ± 0.2 % by mass, and a composed of 100 % glucose.

The limestone powder is referred to by the manufacturer as micro-limestone flour. Per the manufacturer, the limestone powder is passed a #325 sieve (45 μm opening). The particle size distribution of the limestone is shown in Figure 3. Analyses were conducted on samples of the limestone powder to determine its mineralogical, chemical, and physical properties.

The mineralogical analysis by X-ray powder diffraction is based upon replicate analyses of the bulk limestone powder. In addition, X-ray powder diffraction was also performed on insoluble residue of carbonate phase. The insoluble residue was obtained through a 10 % by volume hydrochloric acid extraction of the bulk limestone. The insoluble residue is typically composed of quartz, clays, and other minerals unaffected by the dissolution process. The residue is pipetted onto a glass slide to facilitate identification of the clay minerals, and the slide is analyzed after three treatments: heating to 110 °C to collapse any expandable clays, saturation in a 50% ethylene glycol solution to expand the basal spacing of any expandable clays, and then heating to 550 °C to collapse the layers completely and to decompose specific clay minerals. The most reliable numbers are the carbonates and quartz. Based upon a single measurement of mass loss on dissolution, the insoluble residue was estimated to comprise about 2.5 % of the total limestone powder. The residue also appeared deliquescent, possibly confounding the insoluble residue analysis.

The limestone is composed (Table 1) of calcite, dolomite, tremolite, quartz, talc, a chlorite/smectite inter-stratified clay and an illite/mica. The presence of talc and tremolite is not uncommon in limestones exposed to some metamorphic processes. Scanning Electron Microscopy (SEM) pictures at various magnifications are shown in Figure 4.

Table 1: Physical and mineralogical properties of the limestone flour

Properties	**Values**
Density [kg/m^3]	2815 ± 5
BET surface [m^2/g]	1.05 ± 0.02
Phases [mass %]	
calcite	75 ± 2.6
dolomite	20 ± 2.1
quartz	0.8 ± 0.7
tremolite	2 ± 0.8
talc	0.8 ± 0.2
chlorite	0.7 ± 0.7

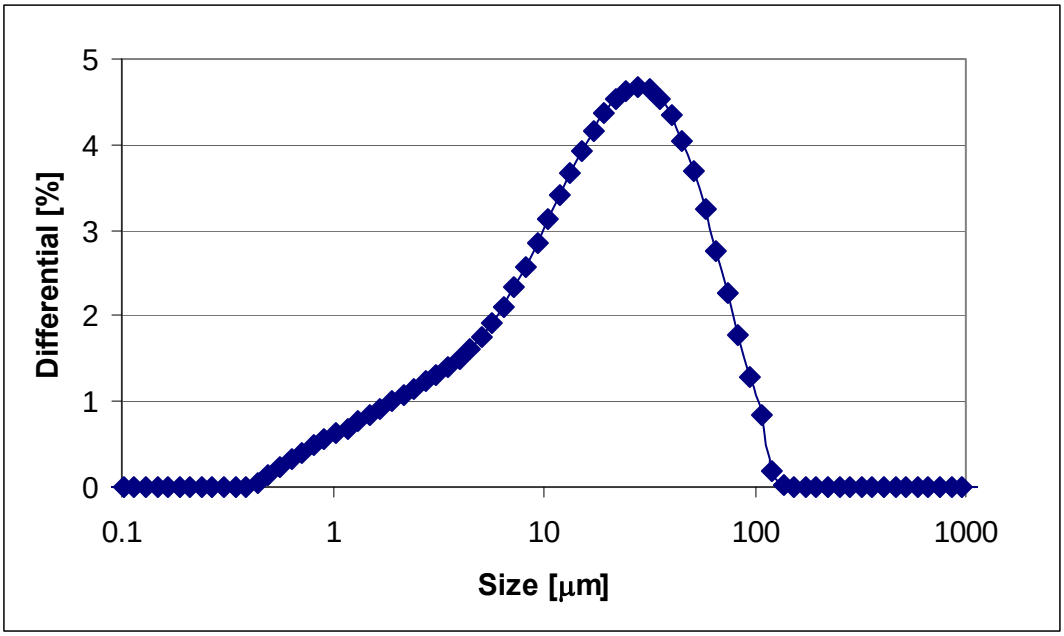

Figure 3: Particle size distribution of the limestone measured in IPA

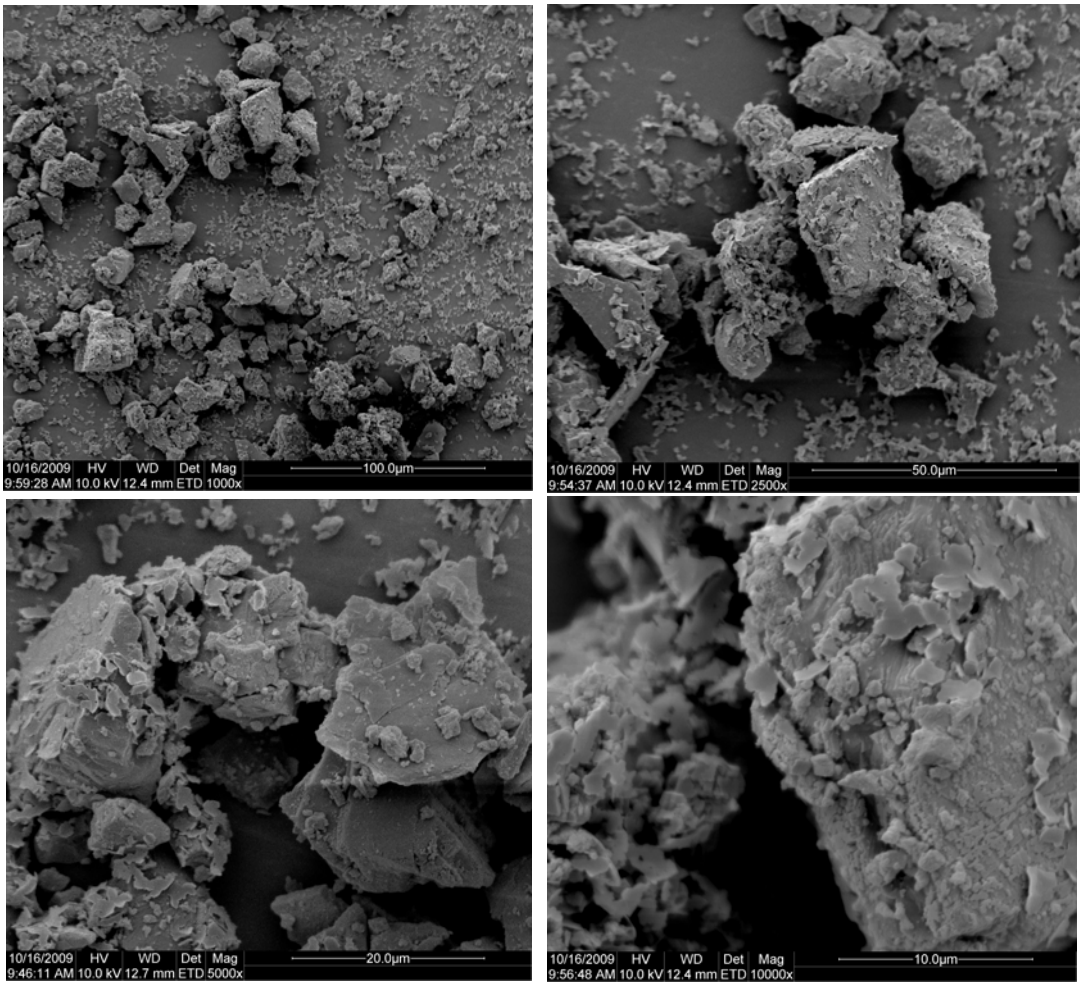

Figure 4: Limestone SEM pictures at various magnifications as indicated by scale bars on the pictures

3.2 Packaging

The corn syrup was purchased in bottle 3.78 L (1 gallon) and the corn syrup in each gallon bottle was repackaged at NIST into the smaller glass bottles containing about 500 g of corn syrup. Each smaller bottle was numbered from 1 to 48 and placed in a box. In total there were 5 boxes labeled CS-BXA (A= 1 to 5).

The limestone was ordered in a bag of 907 kg (2000 lbs). The material was then repackaged into plastic jars with about 600 g each. Each jar was labeled from 1 to 24 and placed in a box BX-A (A = 1 to 20). Prior to final packaging for shipment, the bottles were selected following the scheme shown in Table 2 for CS-BX1 and the corresponding boxes, BX-1 to BX-4, of limestone

The packaged SRM contains enough material to make two batches of paste. It has one glass container labeled “Component 1 Corn Syrup” (400 g) and two plastic

containers labeled “Component 2 Limestone” (each about 500 g). Each of the plastic containers is one batch while the glass bottle contains enough corn syrup for two batches.

3.3 Preparation of the SRM

The SRM batch must be prepared by the operator before it can be used. Once mixed, the shelf life of the mixture is about 7 d. Therefore, it should not be prepared too far in advance of its usage. To prepare the mixture, follow the instructions below.

Mixture composition

- Corn Syrup: 200 g
- Distilled water: 63.16 g
- Limestone: 458.1 g

The equipment and the method are described in ASTM C1738. Introduce the water and the corn syrup (in that order) into the blender, mix for 30 s and then proceed as described in ASTM C1738 to introduce the limestone. The water bath and the rheometer should be maintained at 23 ℃.

Store the mixture in a sealed plastic jar. It is recommended to use a plunger mixer to remix the prepared SRM before each use. Store the SRM in a sealed container, maintained at 23 ℃ ± 2 ℃.

Table 2: Schema for pairing the "Component 1 Corn Syrup" with the two containers of the "Component 2 Limestone" for CS-BX1 and BX-1 to BX-4

Corn Syrup		Limestone	
Box #	Bottle #	Box #	Jar #
CS-BX1	1	BX-1	1-2
	2		3-4
	3		5-6
	4		7-8
	5		9-10
	6		11-12
	7		13-14
	8		15-16
	9		17-18
	10		19-20
	11		21-22
	12		23-24
	13	BX-2	1-2
	14		3-4
	15		5-6
	16		7-8
	17		9-10
	18		11-12
	19		13-14
	20		15-16
	21		17-18
	22		19-20
	23		21-22
	24		23-24
	25	BX-3	1-2
	26		3-4
	27		5-6
	28		7-8
	29		9-10
	30		11-12
	31		13-14
	32		15-16
	33		17-18
	34		19-20
	35		21-22
	36		23-24
	37	BX-4	1-2
	38		3-4
	39		5-6
	40		7-8
	41		9-10
	42		11-12
	43		13-14
	44		15-16
	45		17-18
	46		19-20
	47		21-22
	48		23-24

Table 3: Paring of the boxes of "Component 1 Corn Syrup" (CS-BXA) with the boxes (BX-A) of "Component 2 Limestone."

Corn Syrup	Limestone	
CS-BX1	BX-1 to	BX-4
CS-BX2	BX-5 to	BX-8
CS-BX3	BX-9 to	BX-12
CS-BX4	BX-13 to	BX-16
CS-BX5	BX-17 to	BX-20

4 Experimental Design

Twelve units of the SRM as packaged for sale were randomly selected for testing. Two units were tested each day. As each unit contains two batches of SRM, four tests were done on each day of testing. Each mixture was measured immediately after mixing (labeled as 1 d), and 3 d and 7 d after mixing. The order of each mixture and measurement was randomized as shown in Table 5 and the schedule is shown in Table 6. Each reported value was the average of 3 consecutive tests run back-to-back. All raw data are shown in Appendix B.

Table 4: Set selected to be tested. BL is the corn syrup bottle (see Table 2)

CS-BX5	BL 45
	BL 12
CS-BX1	BL 23
	BL 28
CS-BX3	BL 30
	BL 03
CS-BX5	BL 11
	BL 36
CS-BX3	BL 04
	BL 41
CS-BX1	BL 33
	BL 06

Table 5: Order of testing. CS-BXA = Corn Syrup Box A; BLA= Bottle A of corn syrup (from specified box); LA=Limestone bottle A (associated with specified box and bottle of corn syrup- see Table 2)

Day of mixing			
CS-BX5	BL 45	L 2	A1
	BL 12	L 2	
	BL 12	L 1	
	BL 45	L 1	
CS-BX1	BL 23	L 2	B1
	BL 23	L 1	
	BL 28	L 2	
	BL 28	L 1	
CS-BX3	BL 30	L 1	C1
	BL 03	L 1	
	BL 03	L 2	
	BL 30	L 2	
CS-BX5	BL 11	L 2	D1
	BL 36	L 1	
	BL 11	L 1	
	BL 36	L 2	
CS-BX3	BL 04	L 1	E1
	BL 41	L 2	
	BL 41	L 1	
	BL 04	L 2	
CS-BX1	BL 33	L 1	F1
	BL 06	L 2	
	BL 33	L 2	
	BL 06	L 1	

3 d after mixing			
CS-BX5	BL 12	L 1	A3
	BL 45	L 2	
	BL 45	L 1	
	BL 12	L 2	
CS-BX1	BL 23	L 1	B3
	BL 28	L 1	
	BL 28	L 2	
	BL 23	L 2	
CS-BX3	BL 03	L 1	C3
	BL 30	L 2	
	BL 03	L 2	
	BL 30	L 1	
CS-BX5	BL 36	L 1	D3
	BL 36	L 2	
	BL 11	L 2	
	BL 11	L 1	
CS-BX3	BL 04	L 1	E3
	BL 41	L 2	
	BL 04	L 2	
	BL 41	L 1	
CS-BX1	BL 06	L 2	F3
	BL 33	L 1	
	BL 06	L 1	
	BL 33	L 2	

7 d after mixing			
CS-BX5	BL 12	L 2	A7
	BL 45	L 1	
	BL 45	L 2	
	BL 12	L 1	
CS-BX1	BL 23	L 2	B7
	BL 23	L 1	
	BL 28	L 2	
	BL 28	L 1	
CS-BX3	BL 03	L 1	C7
	BL 30	L 2	
	BL 30	L 1	
	BL 03	L 2	
CS-BX5	BL 36	L 2	D7
	BL 11	L 1	
	BL 11	L 2	
	BL 36	L 1	
CS-BX3	BL 41	L 2	E7
	BL 41	L 1	
	BL 04	L 2	
	BL 04	L 1	
CS-BX1	BL 06	L 1	F7
	BL 06	L 2	
	BL 33	L 1	
	BL 33	L 2	

Table 6: Schedule of testing. HOLIDAY and OFF are days the operator was not available. See Table 5 for the tests done for each A1 to F7.

Week number	Day of the week				
	M	T	W	T	F
W1	*HOLIDAY*	A1			A3
W2	B1	A7		B3	OFF
W3	B7	C1			C3
W4	D1	C7		D3	*OFF*
W5	D7	E1			E3
W6	*HOLIDAY*	E7			*OFF*
W7	F1			F3	
W8	F7				*OFF*

5 Statistical analysis

The data used for the analysis of various rheological quantities for SRM 2492 were collected using a nested design with 3 primary factors: box, day, and unit. Two replicate samples were prepared for each unit, each using corn syrup from the single bottle associated with the unit and the limestone from the two single-use bottles of limestone powder associated with the unit. With this design a linear model can be fit to the data to identify different levels of random variability associated with each of the three primary factors. In addition the run order of the measurements is another factor whose potential effect is addressed by randomization of the run order.

Results derived from the raw data were recorded for three quantities: viscosity (VS), yield strength (YS), and hysteresis (H) from tests carried out on the samples at three different ages (1 d, 3 d, and 7 d). Since age of the sample is believed to have a significant effect a priori, the results at each age are treated as different responses, giving 9 responses in all. The data used in the analysis are shown in Table 1 in Appendix A-1.

The first step in the analysis of the data was an exploratory data analysis. In this analysis plots of the data in run order, versus age, and versus each of the three primary factors were examined for evidence of measurement drift, outliers, factor effects, and any other features that might impact further analysis for certification. In addition, normal probability plots of each response were made to assess the normality of the data, assuming the effects of the other factors are not large. These plots are shown in Appendix A on pages A-2 through A-43 and were made using the software package R [12]. While a few outlying points were observed, these data were not associated with any recognized problems associated with sample preparation or measurement, so no data were omitted from further analysis. (Note, prior to this analysis, while the data were being organized, two observations that were associated with recognized issues in sample preparation or measurement and whose results differed significantly from what was expected and observed for similar cases and were omitted from the analysis. One sample was omitted for all responses at all ages while only the measurements at an age of 1 d for the other sample were affected.) No large factor effects were identified from these plots either, although the

plots suggest that small effects may be present in some cases. Assuming any factor effects that do exist are essentially insignificant relative to the random measurement error, all responses appear to follow a distribution that is approximately normal.

Next a Bayesian hierarchical model was fit to the data to quantify contributions to the overall variability in the data from random errors associated with the factors day and unit. A Bayesian model was used because after the loss of the two samples mentioned above, the data were no longer balanced, limiting the effectiveness of fitting the model using analysis of variance (ANOVA). The validity of inferences drawn using the Bayesian model, in contrast, are not affected by the lack of balance. In addition, the Bayesian analysis provides a clear statistical interpretation with no need for approximation or use of asymptotic results.

The factor box was not included in the model because no large box effect was seen in the exploratory plots and with data sampled from only three of five possible boxes, estimation of a variance component for this factor will be sensitive to prior assumptions. To avoid this situation in the future, NIST plans to sample all, or at least five, levels of the highest level factor in future SRM experiments. Fortunately in this case omission of random variation related to box does not look like it will cause any problems.

To use the Bayesian model, shown in Appendix A on page A-44, prior assessments of the values of each parameter in the model must be provided. The prior assessment for each parameter is specified as probability distribution for the parameter's unknown value. Because these probability distributions are specified independently of the data (i.e. before the data are observed or used), these distributions are commonly called prior distributions. For this analysis, non-informative prior distributions were used. These distributions are essentially very flat and have very large variances so that they will not provide any quantitative information on the values of the parameters as part of the model. In this case uniform distributions, with ranges from -1000 to 1000 for means and ranges of 0 to 1000 for standard deviations, were used. Fitting the model with prior distributions with larger or smaller ranges confirmed that the results were not sensitive to the parameters chosen for the prior distributions.

A probability distribution for each measurement, given with respect to the parameters in the model, is also specified. In this case the random errors associated with each factor were modeled as following a normal distribution. Then, based on the model and the observed data, the prior distributions for each parameter are updated using Bayes' Theorem to obtain new distributions for each parameter given the information in the data. Finally, these new distributions, called posterior distributions, are used to obtain uncertainty intervals about each quantity of interest.

The Bayesian model was fit using Markov Chain Monte Carlo simulation as implemented in the software package WinBUGS [13, 14]. Diagnostic plots (not included in this report) show that the Markov Chains had converged by the 5000th iteration of the simulation. Then 5000 additional iterations were run for each of 5 parallel Markov chains for model validation and to estimate the parameter values. Box plots made using R for model validation are shown in Appendix A on pages A-45 through A-53. These plots show the distributions of the posterior predictive residuals from the model for each data point. The facts that the means of these distributions are randomly scattered around a value of

zero and most distributions have considerable probability near zero support (but do not guarantee) the conclusion that this model provides a reasonable description of the data.

Assuming that the hierarchical model does provide an adequate description of the measurement process, proposed certified values for each of the different rheological quantities were determined from the predictive distribution for a randomly selected unit. Use of the predictive distribution was chosen for this purpose because it accounts for uncertainty from any potential heterogeneity among units and thus is more robust than an assessment that assumes under certain conditions that the material is homogenous. The results are presented graphically on pages A-54 through A-62 of Appendix A. The shaded blue region under each distribution shown in blue indicates the 95 % probability intervals for each quantity. The corresponding values are given by the blue numbers just under the shaded regions.

The empirically determined posterior predictive distributions are well approximated by shifted and scaled Student's t distributions with varying degrees of freedom and standard uncertainties. These distributions are shown as dashed red lines on each of the plots on Appendix A, pages A-54 through A-62.

The corresponding numerical results, which are the values proposed for use on the certificate, are given in Table 7.

Table 7: Certifications results

Parameter	Age [days]	Mean value *y*	Standard Uncertainty *u(y)*	Degree of Freedom *v*	Coverage Factor *k*	Expanded Uncertainty *U*	Lower bound	Upper Bound
YS	1	32.2	1.999	3.7	2.8675	5.7	26.5	38.0
YS	3	26.4	1.242	4.2	2.7251	3.4	23.0	29.7
YS	7	26.2	1.753	4.0	2.7764	4.9	21.3	31.1
VS	1	7.2	0.537	4.0	2.7764	1.5	5.7	8.6
VS	3	6.5	0.481	4.0	2.7764	1.3	5.1	7.8
VS	7	7.1	0.885	4.1	2.7499	2.4	4.7	9.5
H	1	394	106.6	4.4	2.6905	295	99	689
H	3	358	61.5	3.9	2.8047	173	185	530
H	7	432	110.5	3.6	2.9024	321	111	752

6 Summary

A new paste reference material was developed that consists of a mixture of two components, corn syrup and fine limestone that is a suspension. The uniqueness of this material is that it has the texture of the cement paste with a fine powder in a liquid. The user needs to prepare the mixture according to the proportions defined in the certificate and mix it using ASTM C1738. The certified values were determined using an extensive experimental design and statistical analysis. Inter-laboratory tests on different rheometers geometries would allow a better understanding of the usage of this material. In the future addition of fine and coarse aggregates could be used to develop an SRM for characterizing the performance of mortar and concrete rheometers.

7 References

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8 Appendix

Three appendixes are provided here.

Appendix A: Statistical analysis

Provides all the graphs needed for the interpretation of the results and the extraction of the certified values]

Appendix B: Data as collected

Provides all the data for each tests that were performed

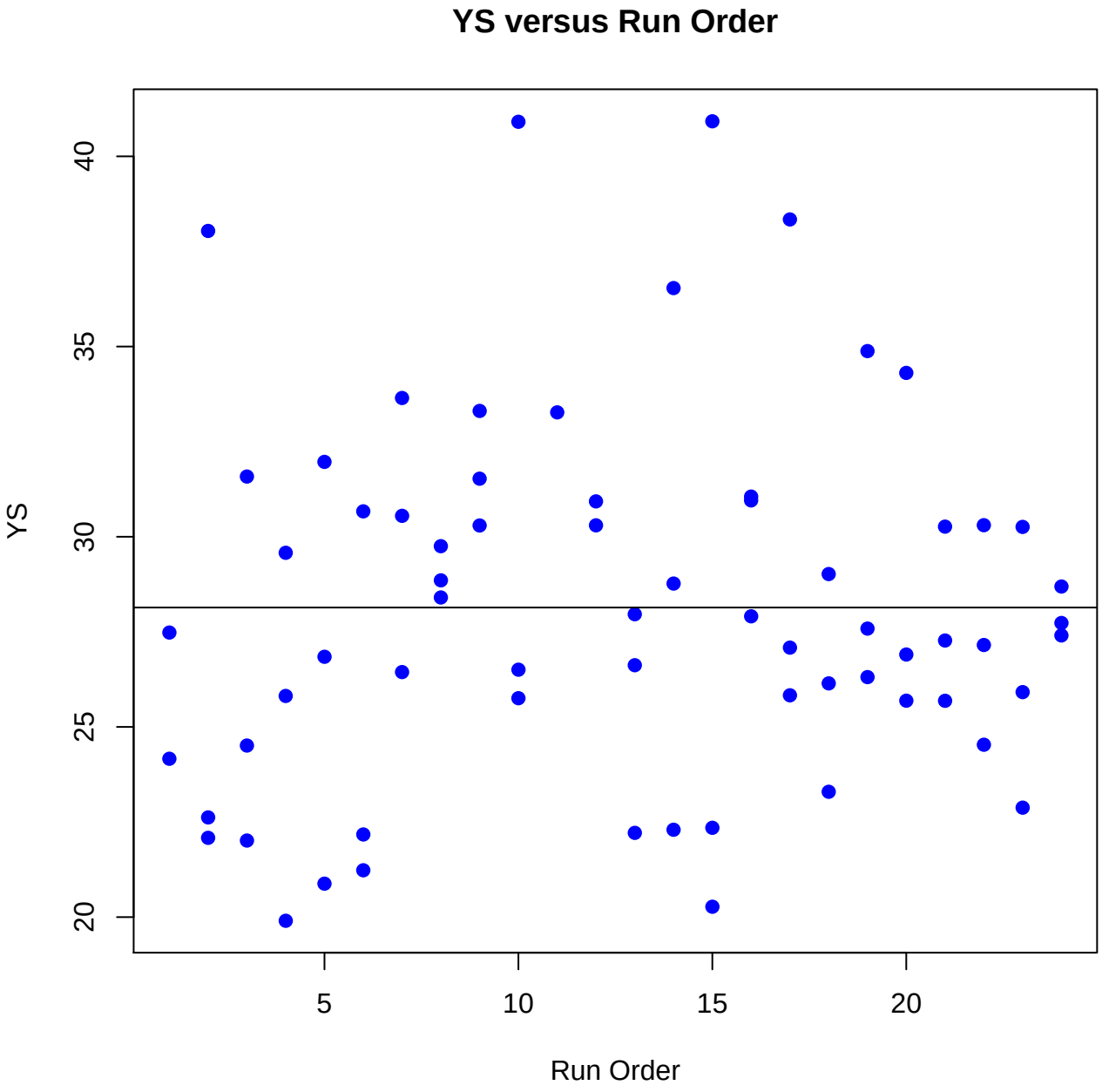
Appendix C: Draft certificate

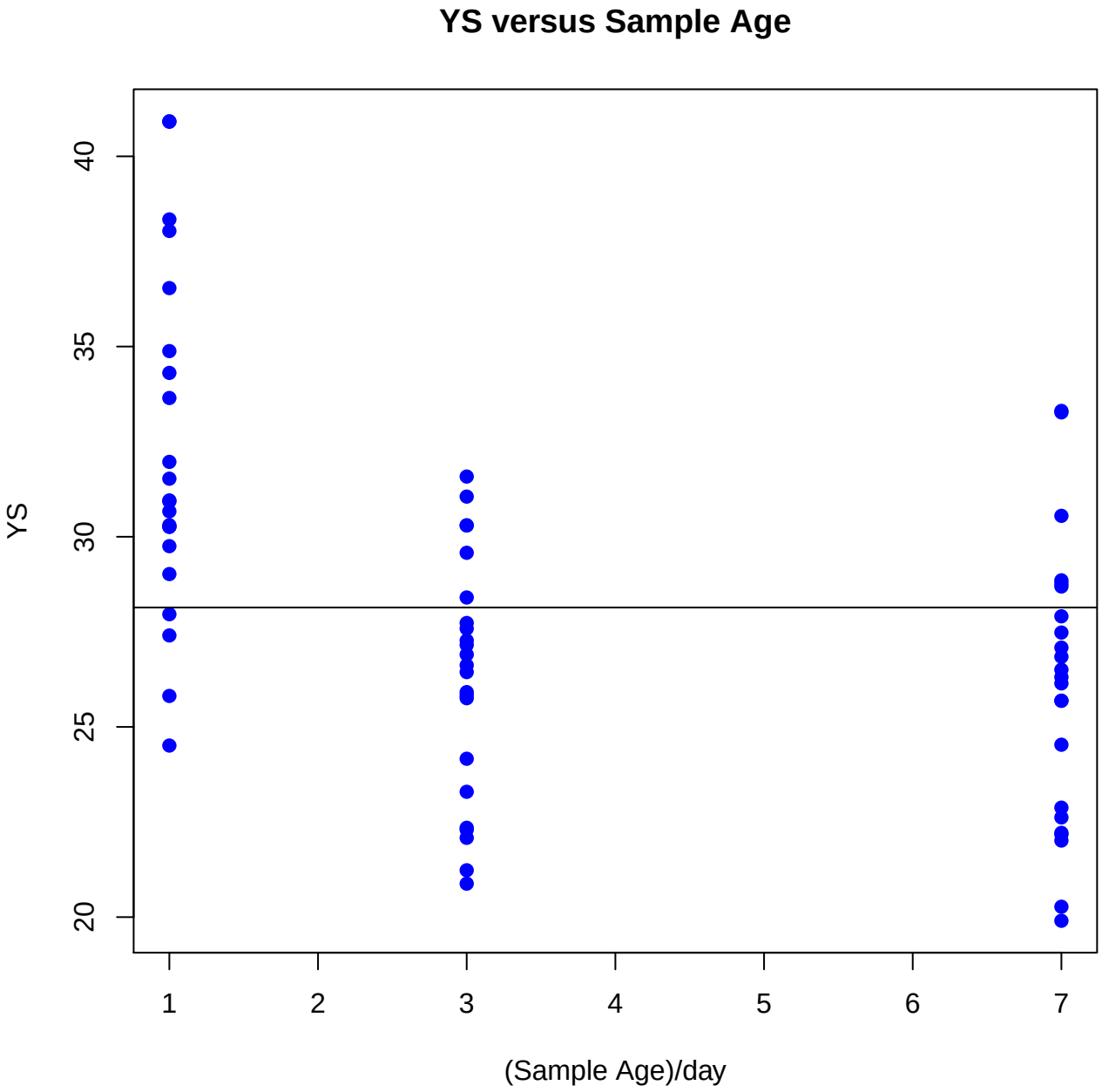
Proposed certificate for this SRM

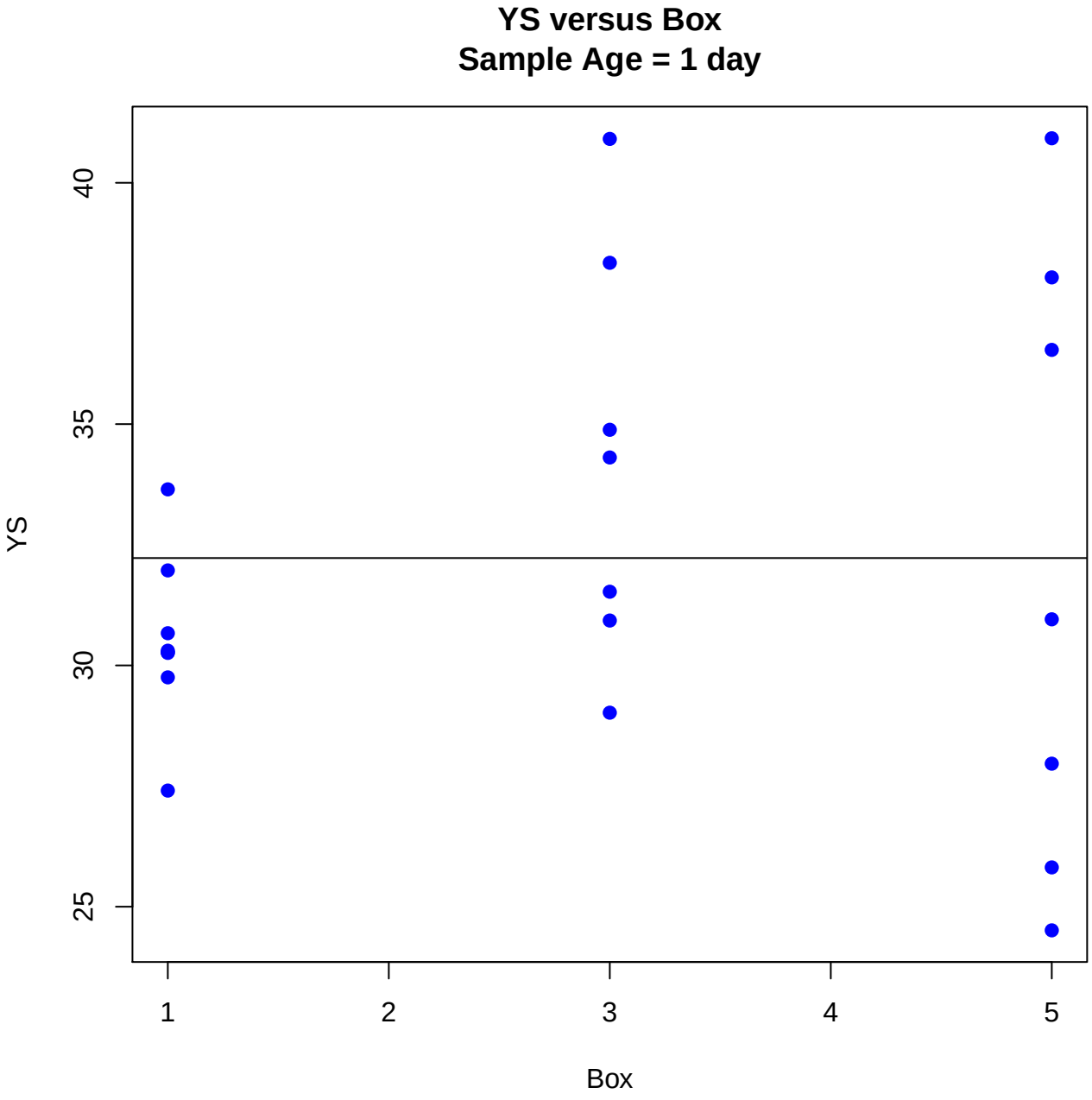
Appendix A: Statistical analysis

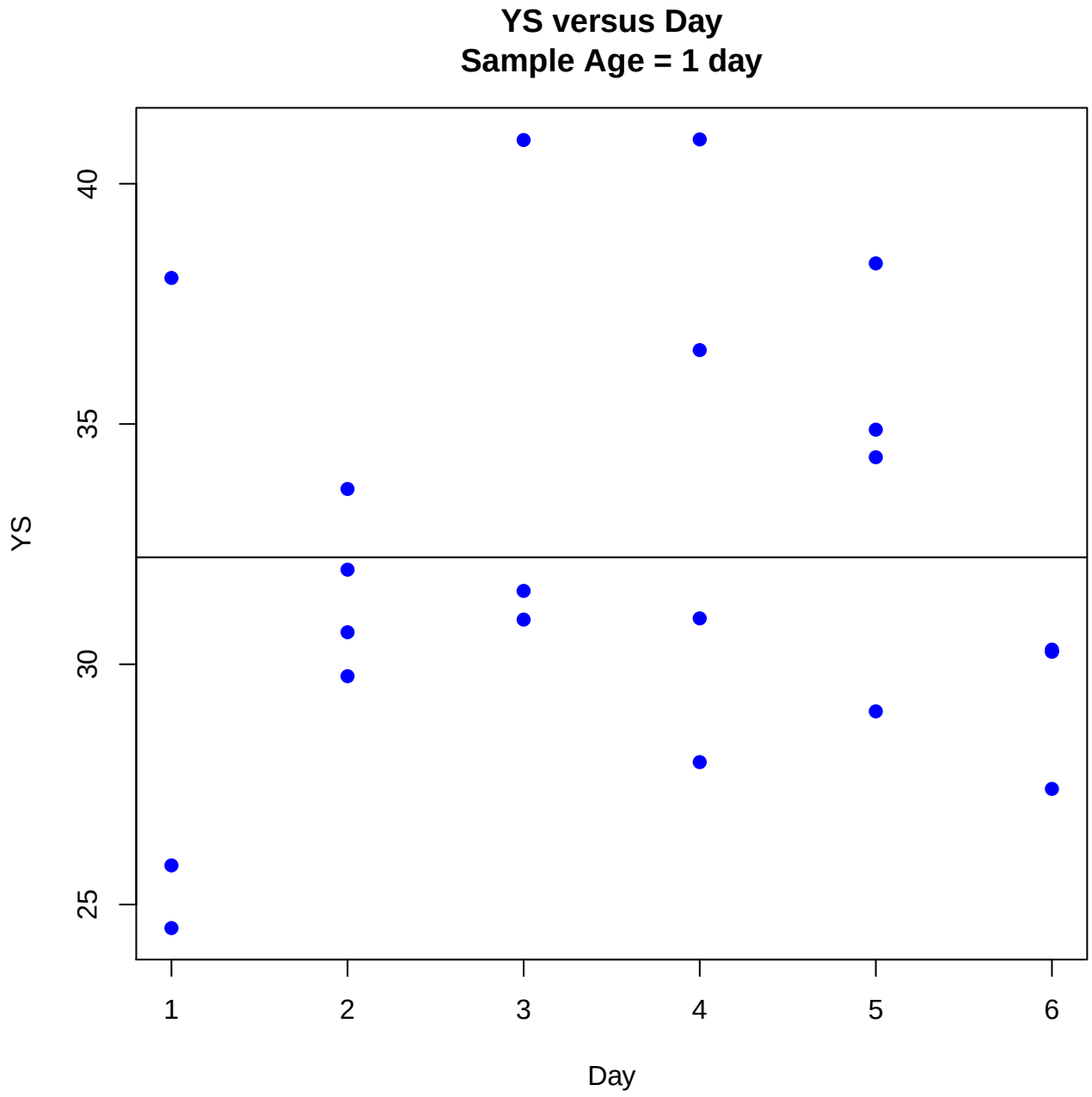
Table 1: Data Used for Analysis of Rheological Quantities in SRM 2492

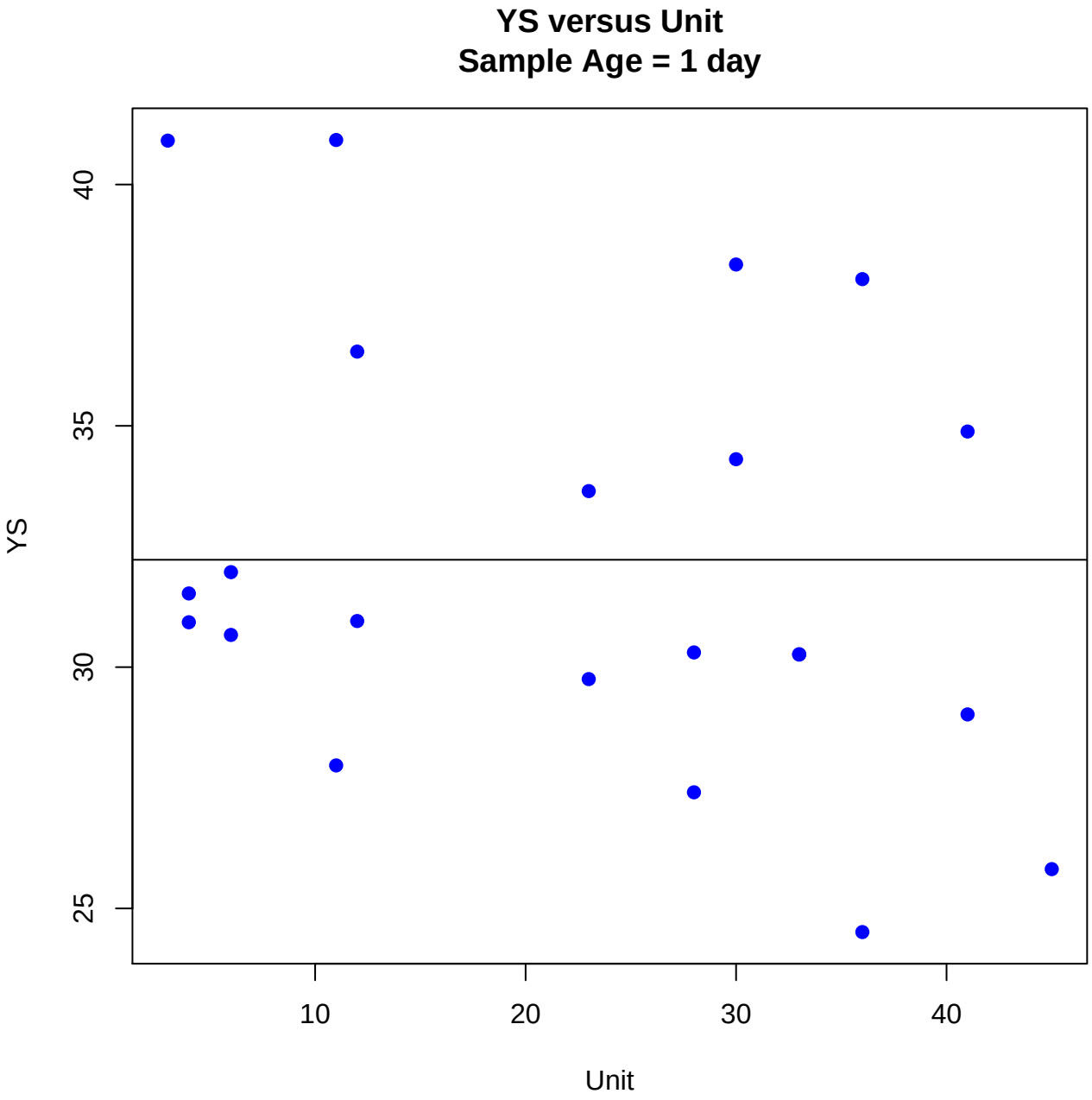
Box	Day	Unit	Run Order	Set	Mix	Sample Age	YS	VS	H
5	1	36	3	A-A	SR-36A	1	24.5110045	5.1016855	146.8300575
5	1	36	2	A-B	SR-36B	1	38.0401892	8.1029882	599.5369540
5	1	45	4	A-C	SR-36C	1	25.8148958	5.8139769	117.0870575
1	2	6	6	B-A	SR-40A	1	30.6676323	6.7706980	247.0875517
1	2	6	5	B-B	SR-40B	1	31.9687011	6.2583598	225.3642414
1	2	23	8	B-C	SR-40C	1	29.7526755	5.9528474	54.9344828
1	2	23	7	B-D	SR-40D	1	33.6481204	6.2264754	239.7996437
3	3	3	10	C-A	SR-44A	1	40.9097872	7.7255608	378.1561494
3	3	4	9	C-C	SR-44C	1	31.5270166	6.5656445	293.6485057
3	3	4	12	C-D	SR-44D	1	30.9301647	7.8978678	526.5810690
5	4	11	15	D-A	SR-48A	1	40.9228014	9.0414858	543.5712989
5	4	11	13	D-B	SR-48B	1	27.9637276	6.8837762	614.8989310
5	4	12	14	D-C	SR-48C	1	36.5382341	9.0765700	717.7008966
5	4	12	16	D-D	SR-48D	1	30.9553752	7.2002657	572.7330920
3	5	30	17	E-A	SR-52A	1	38.3427266	8.9562687	706.4550345
3	5	30	20	E-B	SR-52B	1	34.3079516	8.3760898	563.2652069
3	5	41	19	E-C	SR-52C	1	34.8819674	7.7935623	587.3330805
3	5	41	18	E-D	SR-52D	1	29.0200882	6.9085865	295.1170575
1	6	28	24	F-A	SR-56A	1	27.4064311	6.0623746	189.5276552
1	6	28	22	F-B	SR-56B	1	30.3046501	6.8273581	315.7559080
1	6	33	21	F-C	SR-56C	1	30.2671011	7.1294649	424.8945402
1	6	33	23	F-D	SR-56D	1	30.2593577	7.1223806	439.7840690
5	1	36	1	A-A	SR-36A	3	24.1646169	5.9407810	388.6830280
5	1	36	4	A-B	SR-36B	3	29.5791610	5.8758382	157.2732069
5	1	45	3	A-C	SR-36C	3	31.5838727	8.5889335	849.5092414
5	1	45	2	A-D	SR-36D	3	22.0854227	2.3488017	134.9444368
1	2	6	5	B-A	SR-40A	3	20.8806913	6.4036422	348.7458966
1	2	6	8	B-B	SR-40B	3	28.4042413	7.0300782	437.3904598
1	2	23	6	B-C	SR-40C	3	21.2323524	5.0011123	174.5939540
1	2	23	7	B-D	SR-40D	3	26.4431069	6.0527440	281.3226207
3	3	3	9	C-A	SR-44A	3	30.2971650	6.5695726	316.7324138
3	3	4	12	C-C	SR-44C	3	30.3013303	7.4190595	387.1662931
3	3	4	10	C-D	SR-44D	3	25.7562635	7.3818142	384.6182529
5	4	11	16	D-A	SR-48A	3	31.0566899	7.4412754	556.6608161
5	4	11	15	D-B	SR-48B	3	22.3494888	5.6741953	264.2272414
5	4	12	13	D-C	SR-48C	3	26.6234349	6.4669795	323.0796897
5	4	12	14	D-D	SR-48D	3	22.2976615	5.4819550	390.7078161
3	5	30	17	E-A	SR-52A	3	25.8318625	5.9426656	194.8256552
3	5	30	19	E-B	SR-52B	3	27.5853633	7.5549883	443.8862299
3	5	41	20	E-C	SR-52C	3	26.9038812	6.6001826	324.9805862
3	5	41	18	E-D	SR-52D	3	23.2954879	6.7505388	226.9700690
1	6	28	23	F-A	SR-56A	3	25.9154553	6.9236756	275.1048391
1	6	28	21	F-B	SR-56B	3	27.2727937	6.8631364	372.4610000
1	6	33	22	F-C	SR-56C	3	27.1549715	7.1699433	546.3303563
1	6	33	24	F-D	SR-56D	3	27.7331164	7.1055978	427.0552299
5	1	36	4	A-A	SR-36A	7	19.9051407	4.7455120	388.6830280
5	1	36	1	A-B	SR-36B	7	27.4822066	6.4180012	304.4382759
5	1	45	2	A-C	SR-36C	7	22.6220785	5.8523519	272.0207701
5	1	45	3	A-D	SR-36D	7	22.0136765	2.1003748	124.5567241
1	2	6	6	B-A	SR-40A	7	22.1736762	7.0879147	348.7458966
1	2	6	5	B-B	SR-40B	7	26.8448403	6.4325844	214.5191034
1	2	23	8	B-C	SR-40C	7	28.8543050	8.3980825	601.1702989
1	2	23	7	B-D	SR-40D	7	30.5505157	7.5460083	455.6541207
3	3	3	9	C-A	SR-44A	7	33.3086333	8.2172872	316.7324138
3	3	4	11	C-C	SR-44C	7	33.2698608	9.4654822	786.6936897
3	3	4	10	C-D	SR-44D	7	26.5053460	8.2890339	657.7171264
5	4	11	14	D-A	SR-48A	7	28.7693956	7.1507935	556.6608161
5	4	11	15	D-B	SR-48B	7	20.2730109	5.2310988	128.2817126
5	4	12	16	D-C	SR-48C	7	27.9085225	8.3296071	557.1381379
5	4	12	13	D-D	SR-48D	7	22.2157613	6.1402875	380.5573678
3	5	30	20	E-A	SR-52A	7	25.6899137	5.8753332	194.8256552
3	5	30	19	E-B	SR-52B	7	26.3105599	7.4751330	415.9729425
3	5	41	18	E-C	SR-52C	7	26.1451842	7.3548969	626.8820690
3	5	41	17	E-D	SR-52D	7	27.0854980	9.5732202	724.8317011
1	6	28	21	F-A	SR-56A	7	25.6876456	8.6560791	275.1048391
1	6	28	22	F-B	SR-56B	7	24.5331561	6.5800304	393.8614483
1	6	33	23	F-C	SR-56C	7	22.8786002	5.4678895	131.3401149
1	6	33	24	F-D	SR-56D	7	28.6917284	10.0329962	1034.0398391

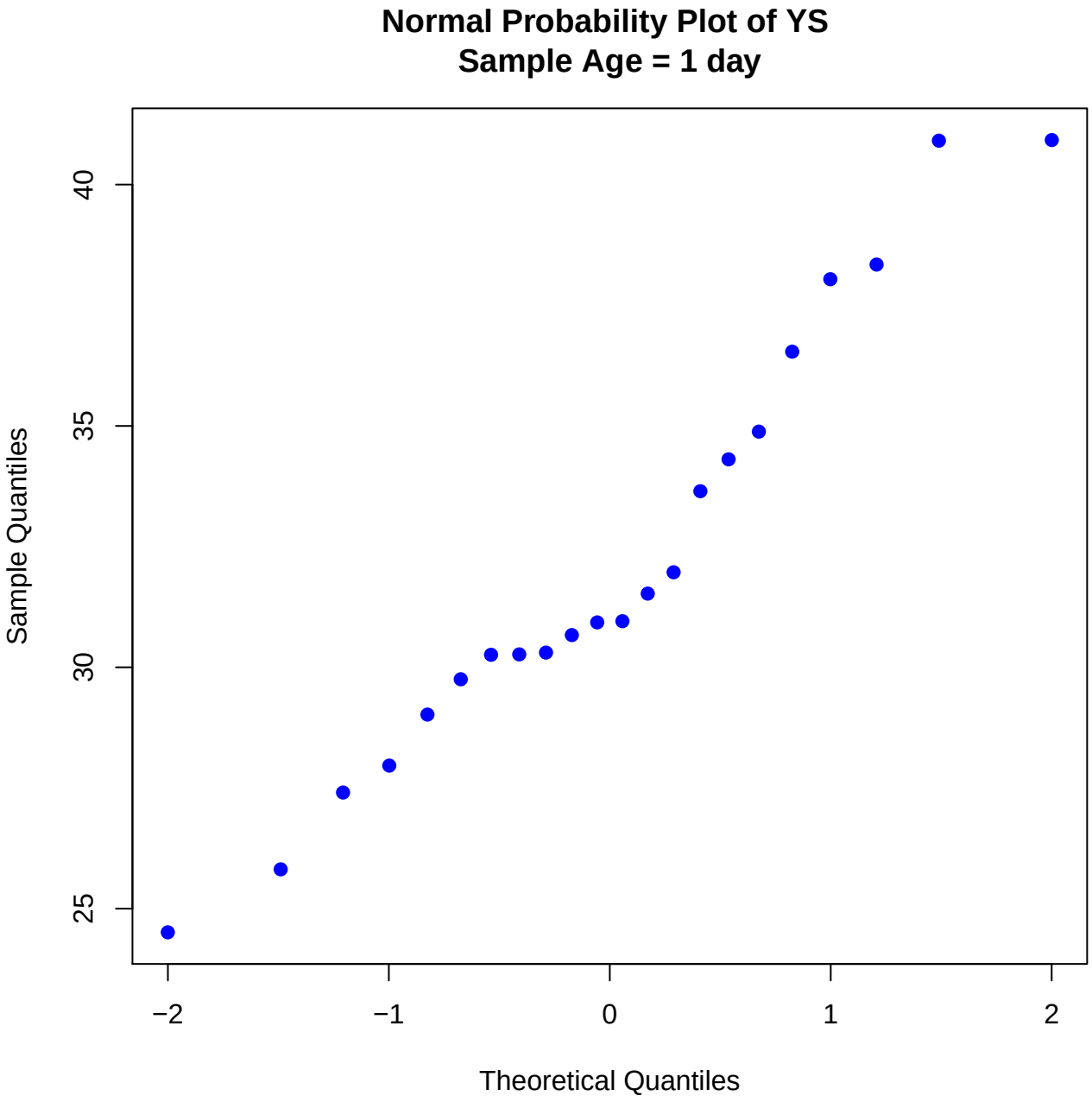

YS versus Run Order
YS
20
25
30
35
40
5
10
15
20
Run Order

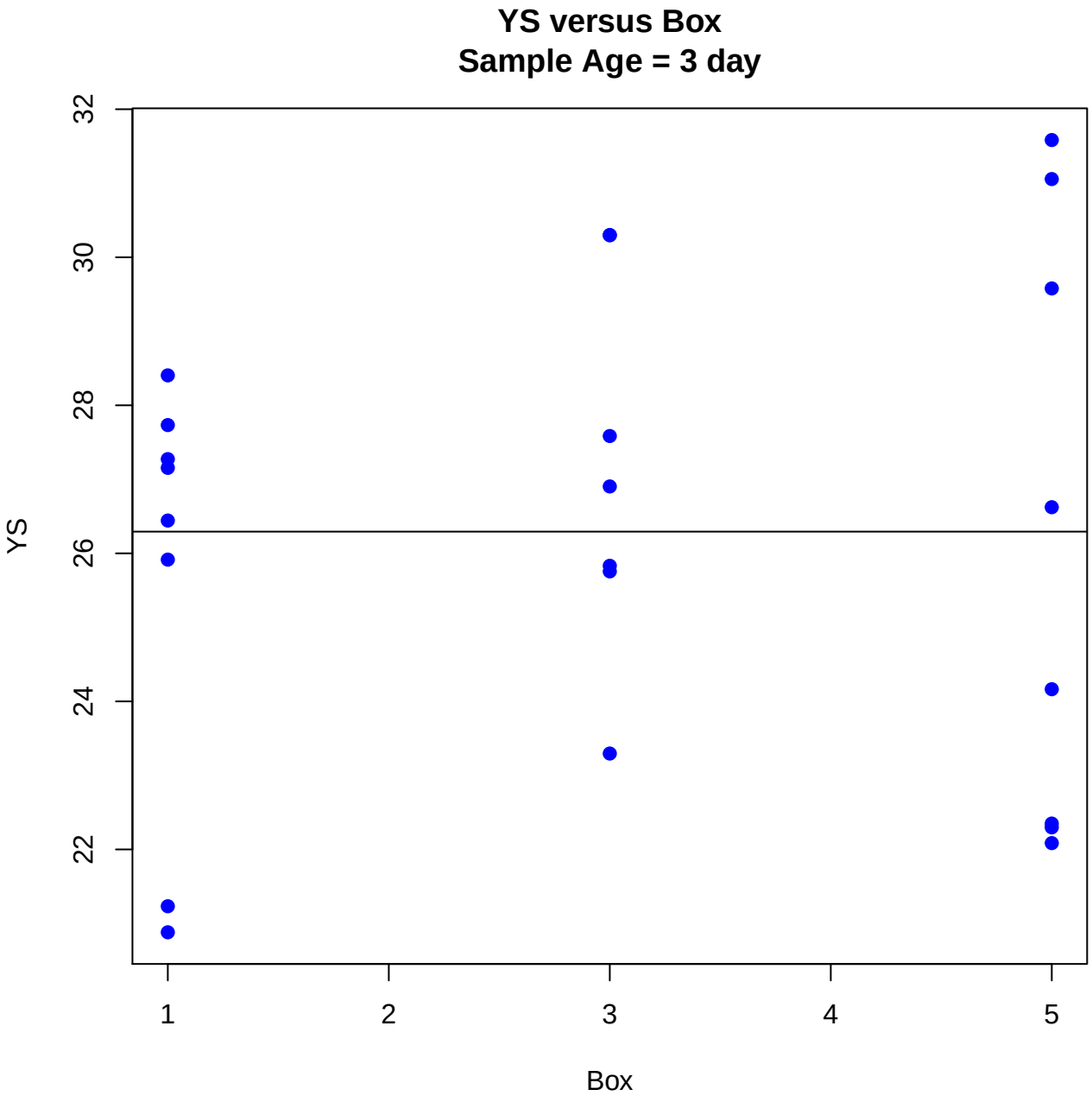

YS versus Sample Age
YS
40
35
30
25
20
1
2
3
4
5
6
7
(Sample Age)/day

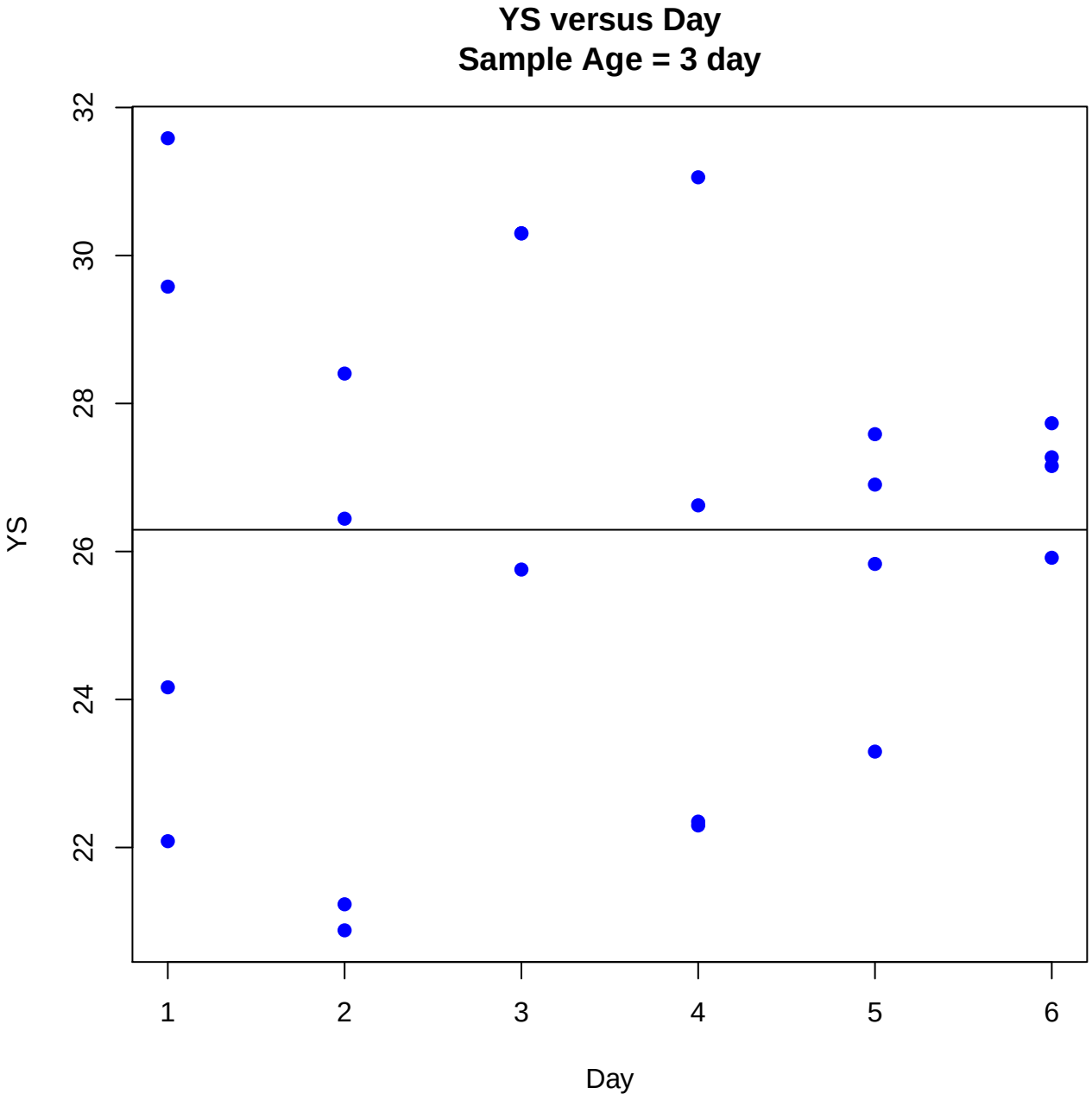

YS versus Box
Sample Age = 1 day
YS
40
35
30
25
1
2
3
4
5
Box

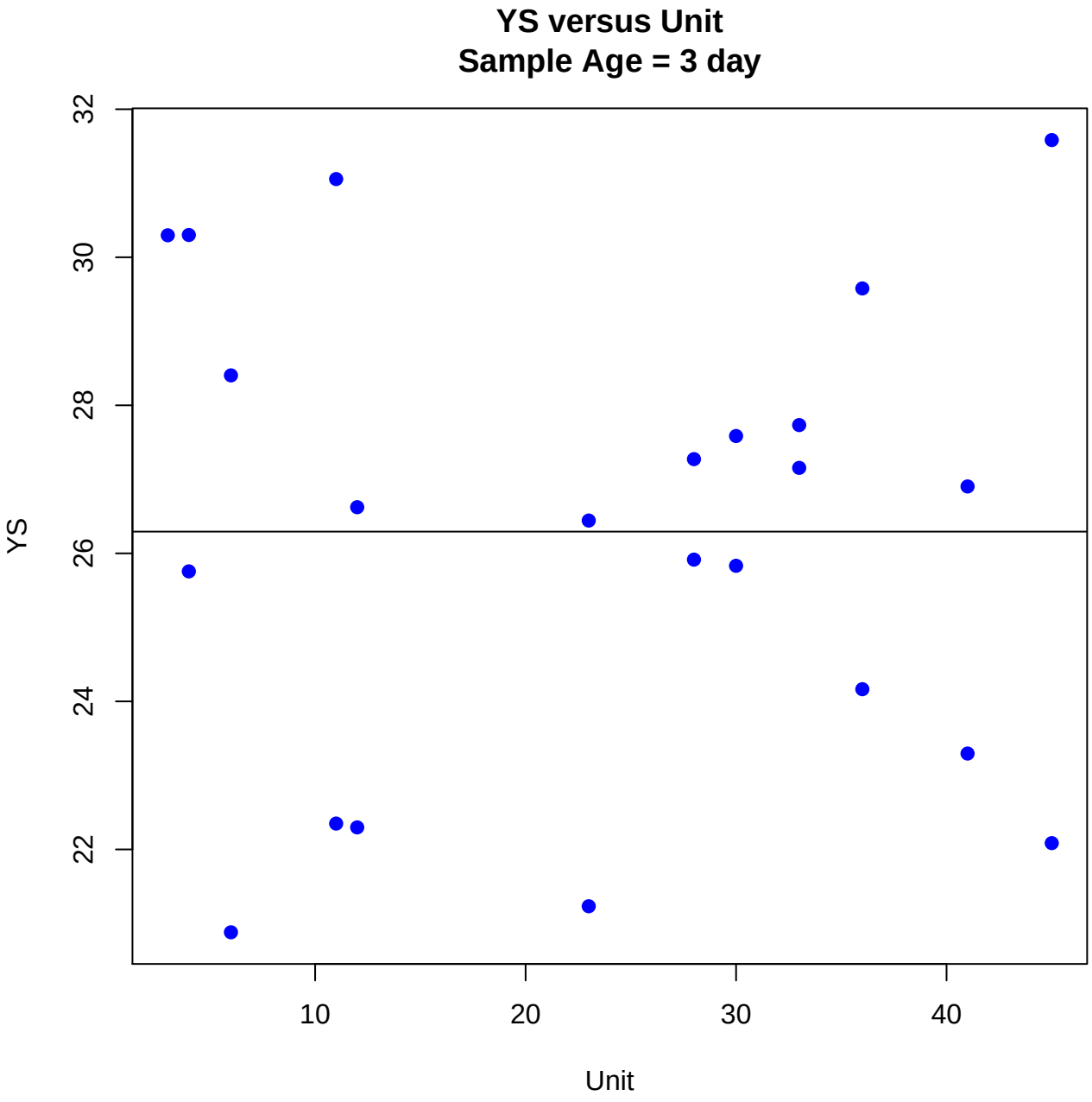

YS versus Day
Sample Age = 1 day
YS
40
35
30
25
1
2
3
4
5
6
Day

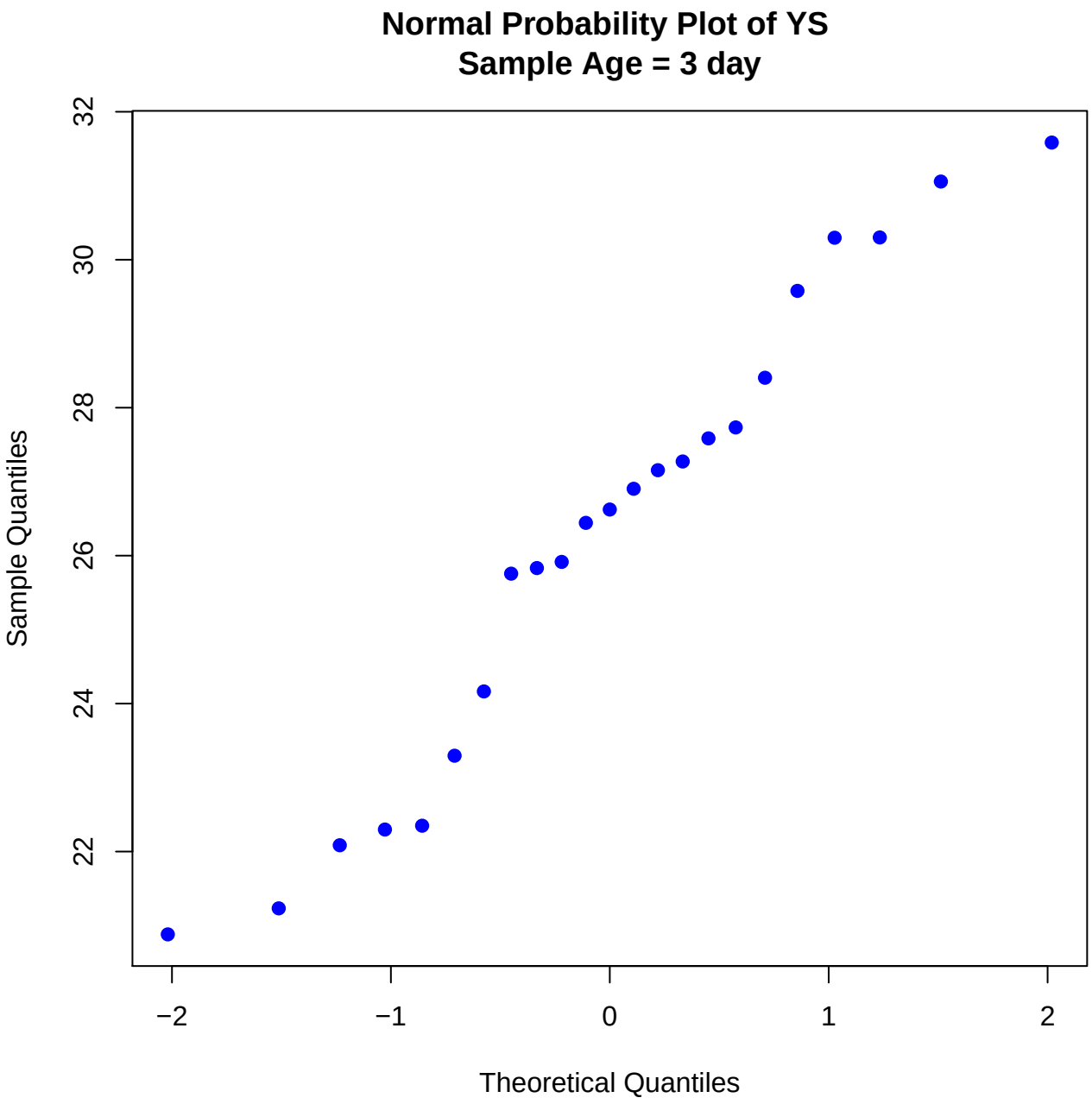

YS versus Unit
Sample Age = 1 day
YS
40
35
30
25
10
20
30
40
Unit

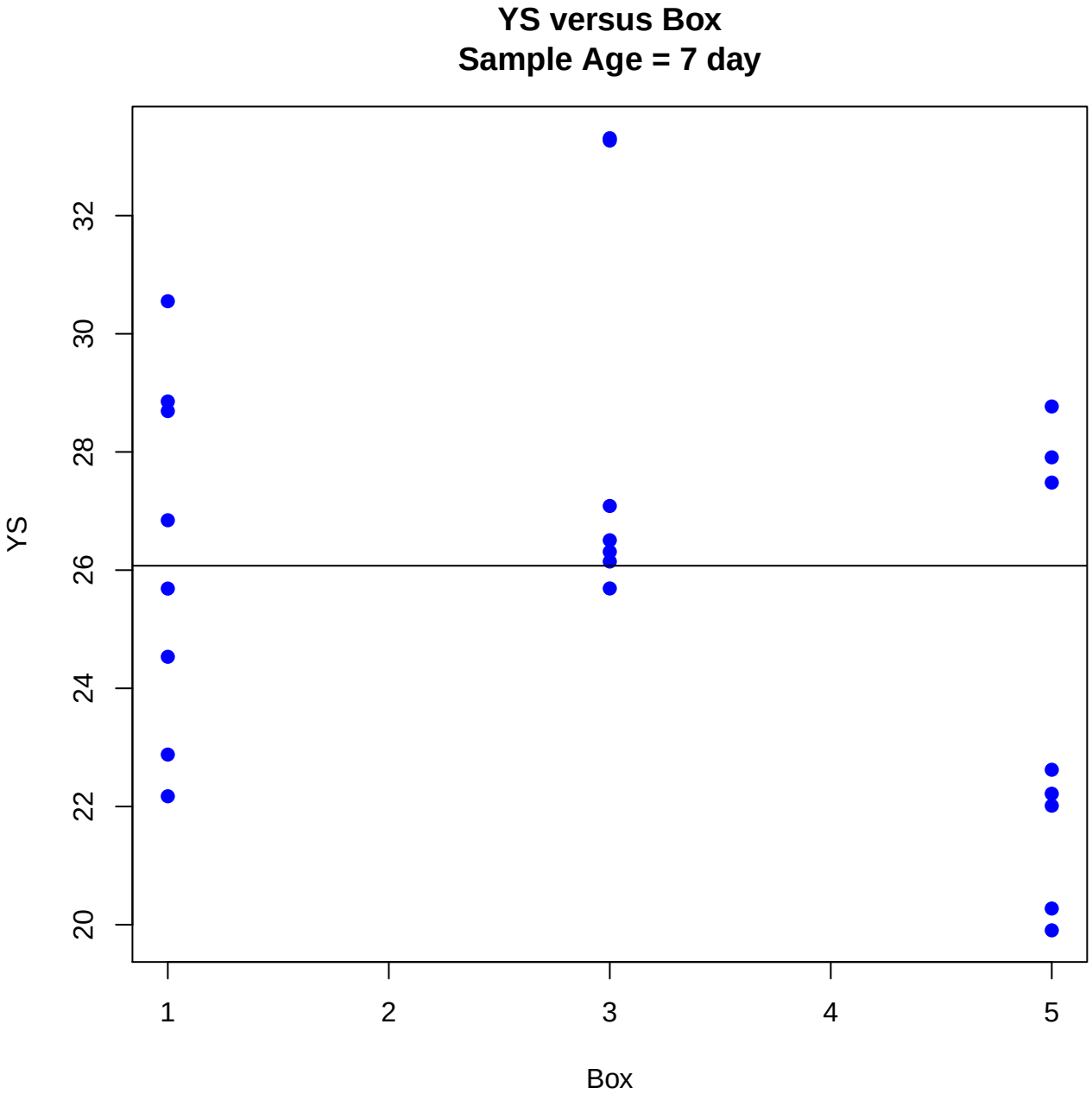

Normal Probability Plot of YS
Sample Age = 1 day
Sample Quantiles
25
30
35
40
−2
−1
0
1
2
Theoretical Quantiles

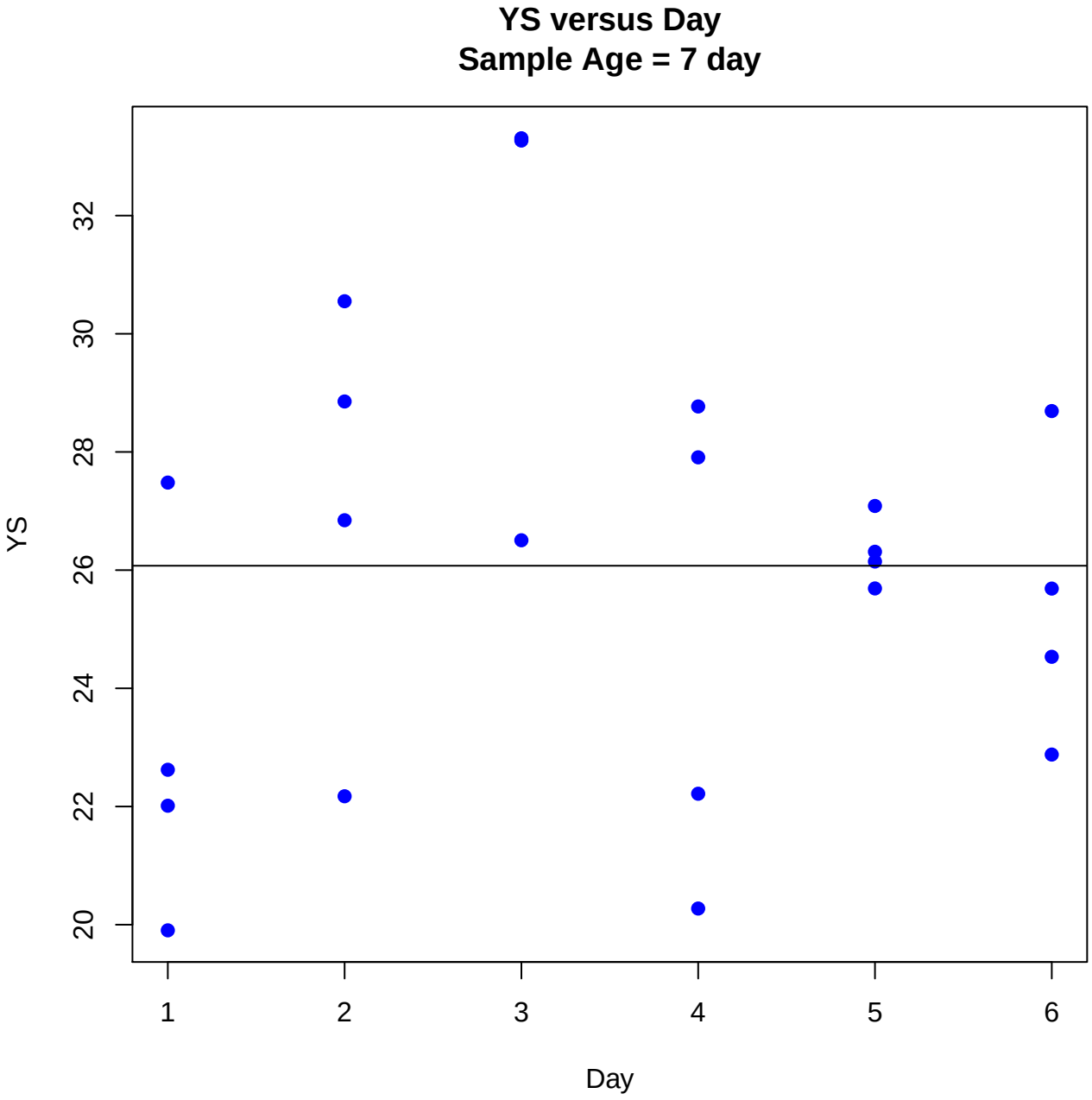

YS versus Box
Sample Age = 3 day
YS
32
30
28
26
24
22
1
2
3
4
5
Box

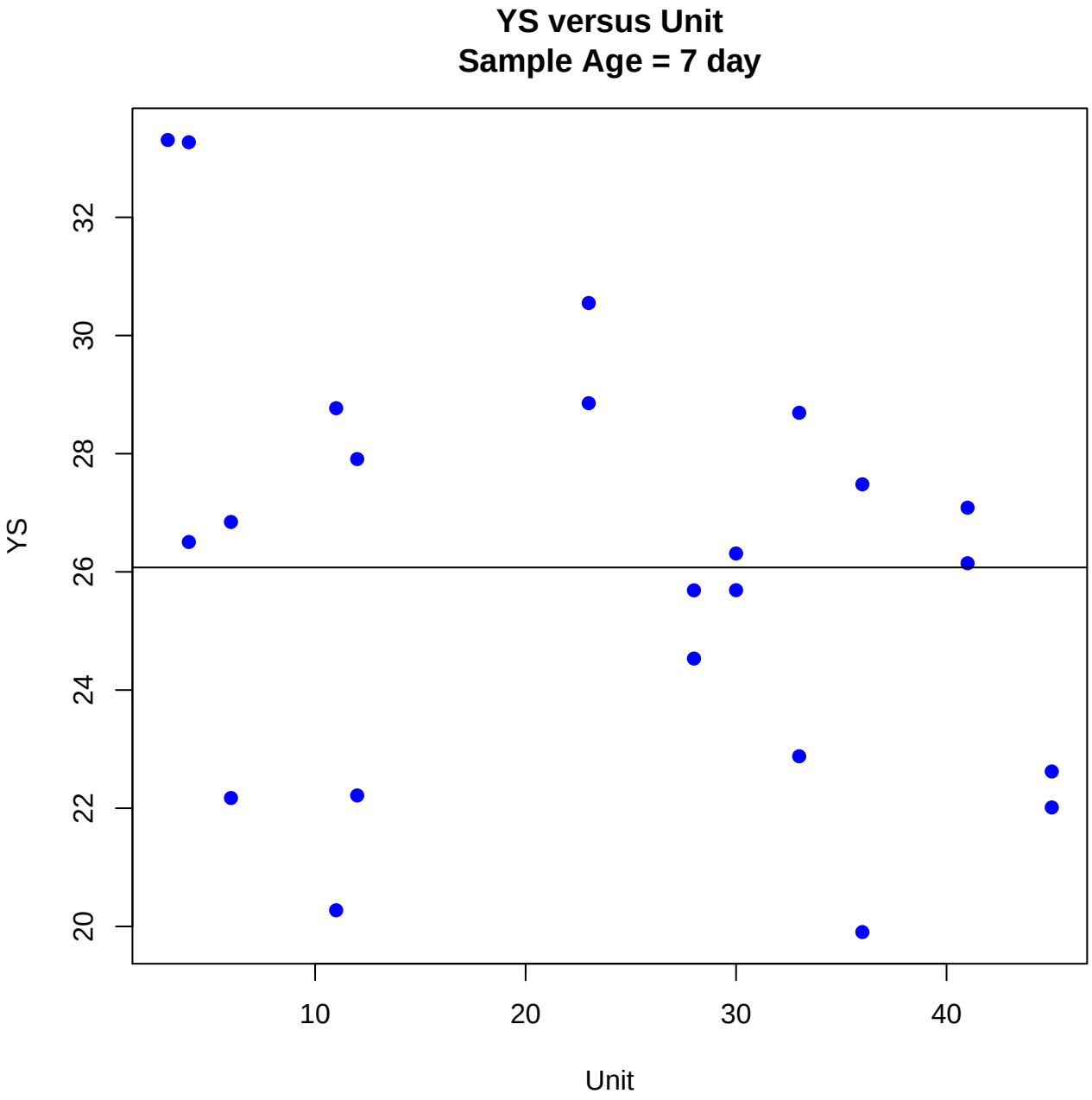

YS versus Day
Sample Age = 3 day
YS
32
30
28
26
24
22
1
2
3
4
5
6
Day

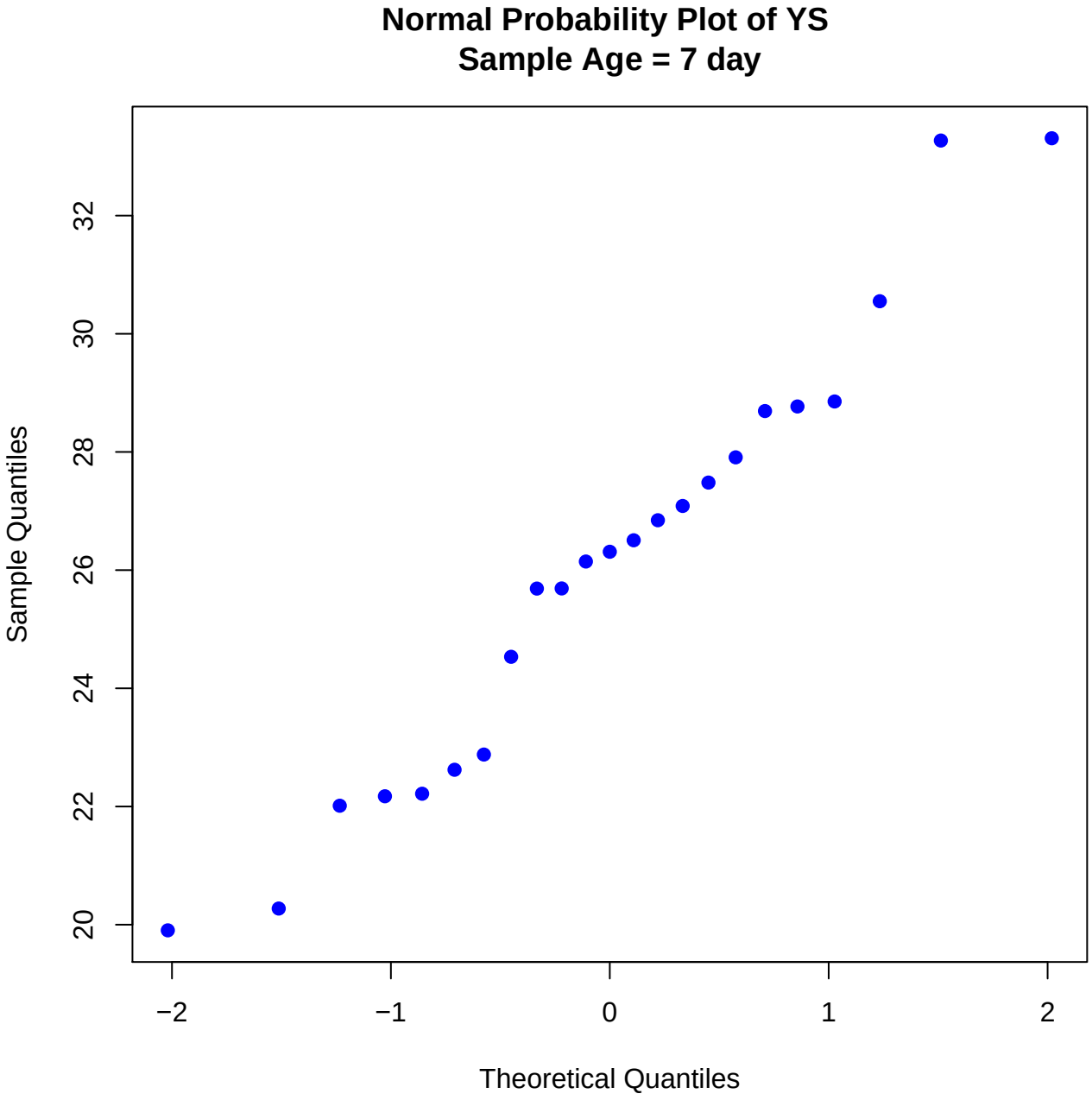

YS versus Unit
Sample Age = 3 day
YS
32
30
28
26
24
22
10
20
30
40
Unit

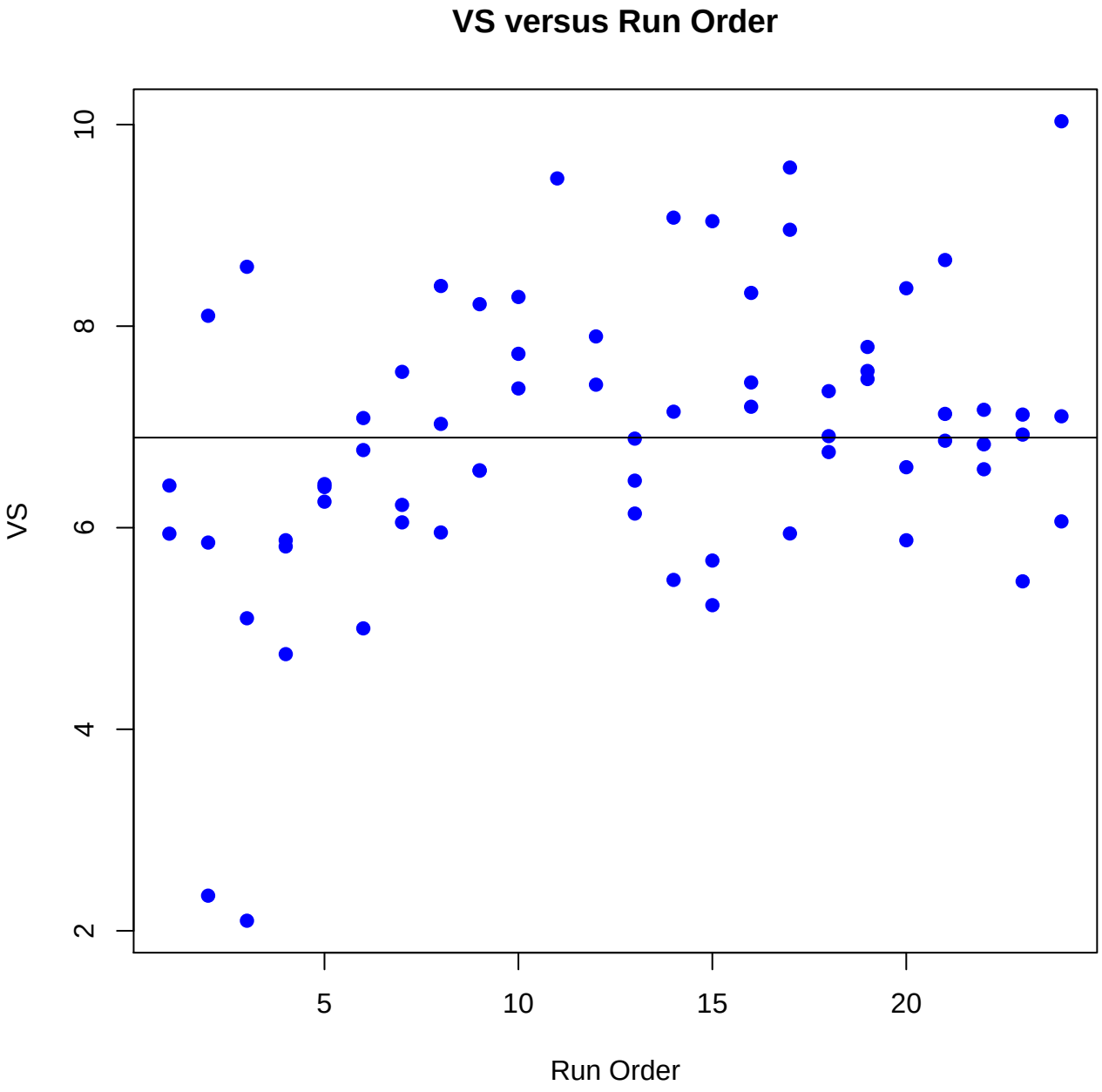

Normal Probability Plot of YS
Sample Age = 3 day
Sample Quantiles
32
30
28
26
24
22
−2
−1
0
1
2
Theoretical Quantiles

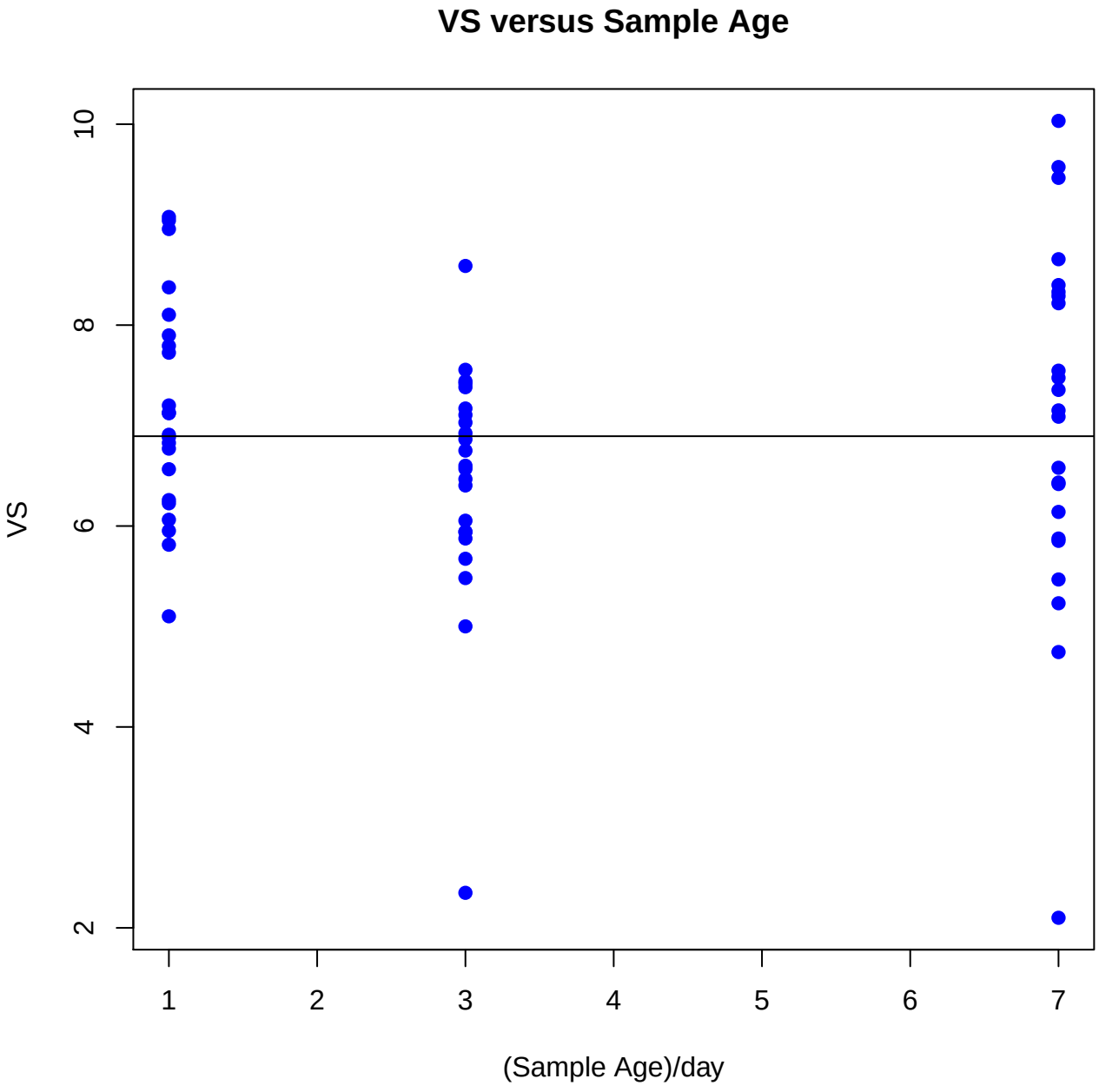

YS versus Box
Sample Age = 7 day
YS
20
22
24
26
28
30
32
1
2
3
4
5
Box

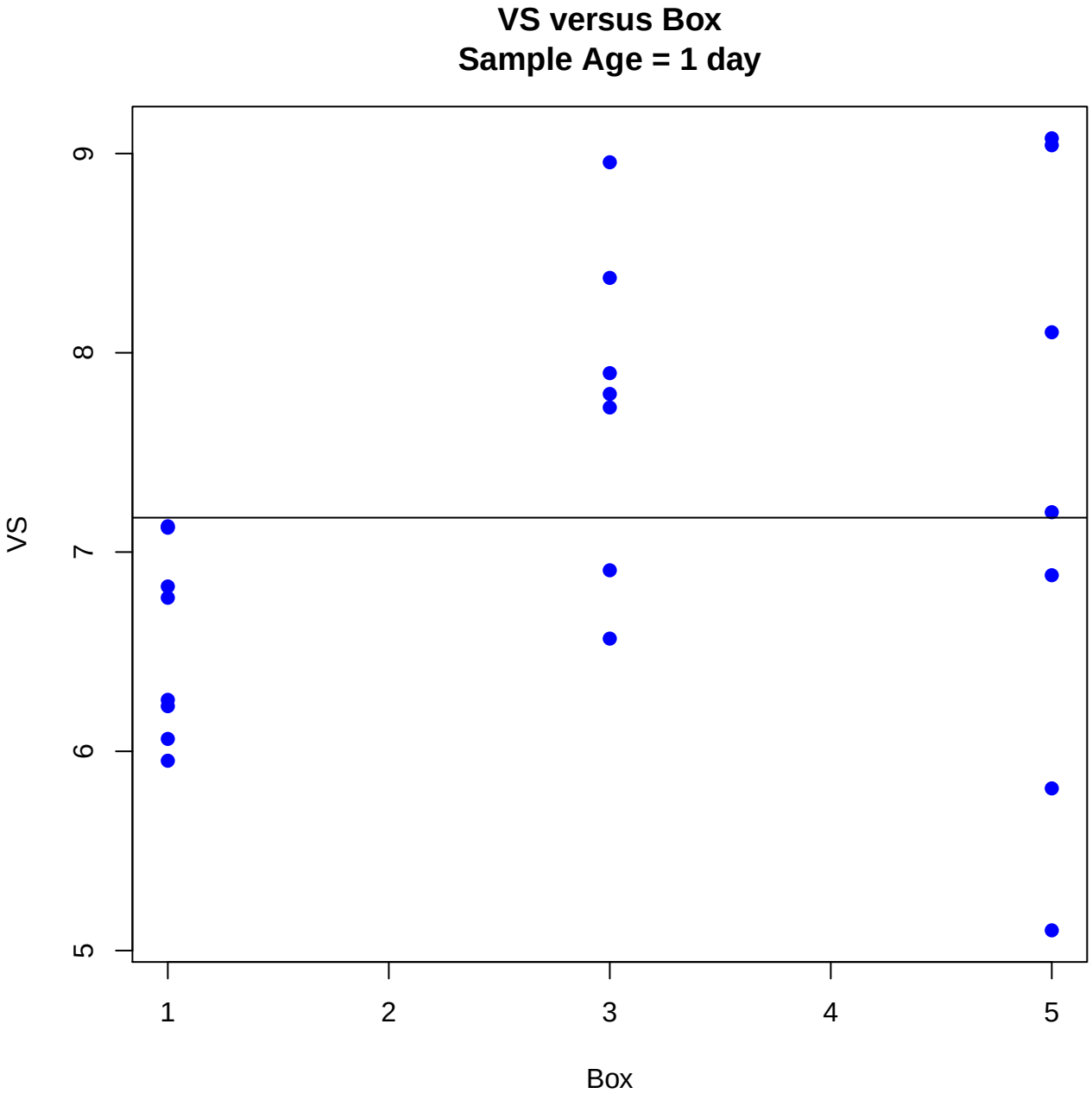

YS versus Day
Sample Age = 7 day
YS
20
22
24
26
28
30
32
1
2
3
4
5
6
Day

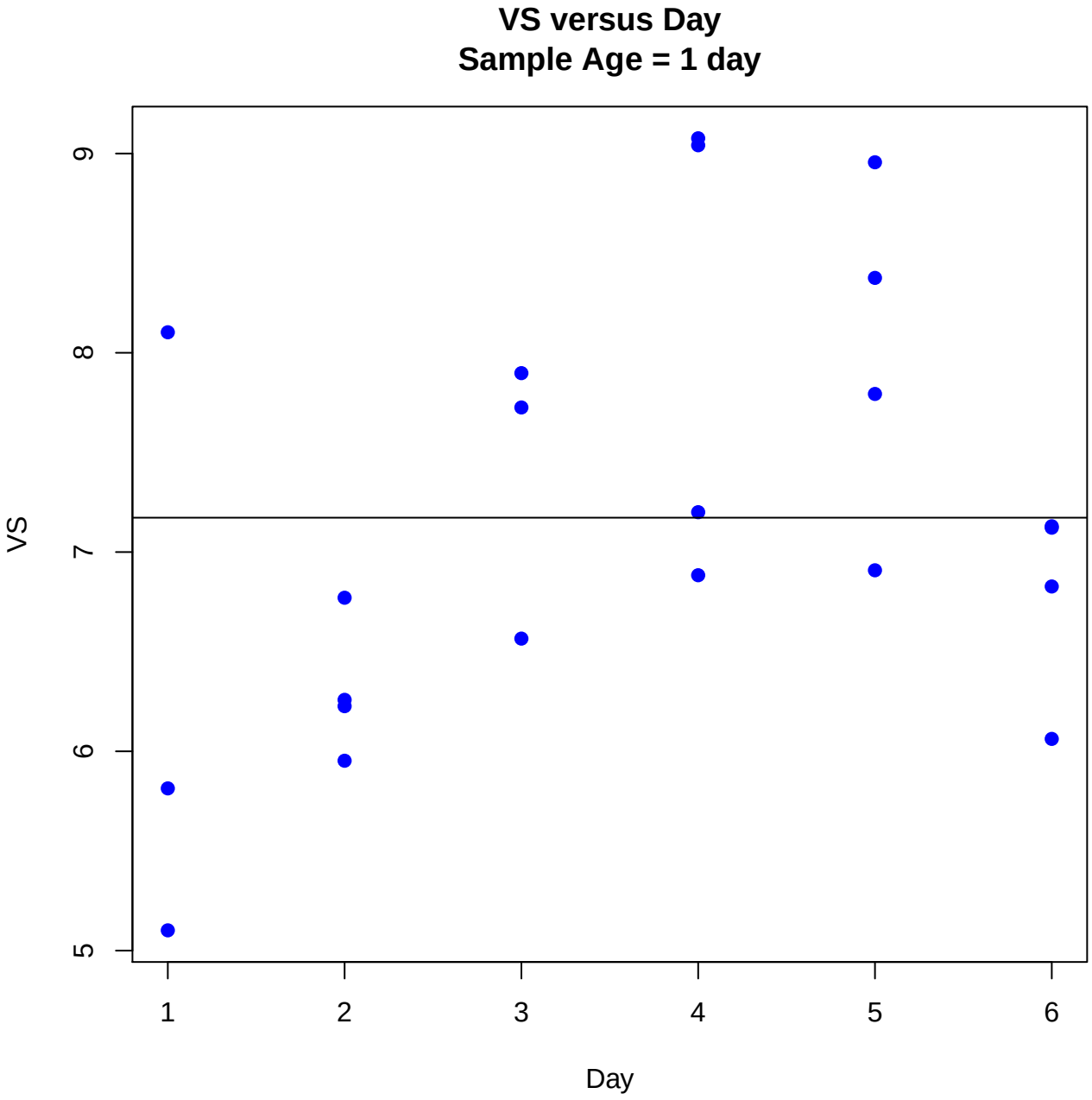

YS versus Unit
Sample Age = 7 day
YS
Unit
20
22
24
26
28
30
32
10
20
30
40

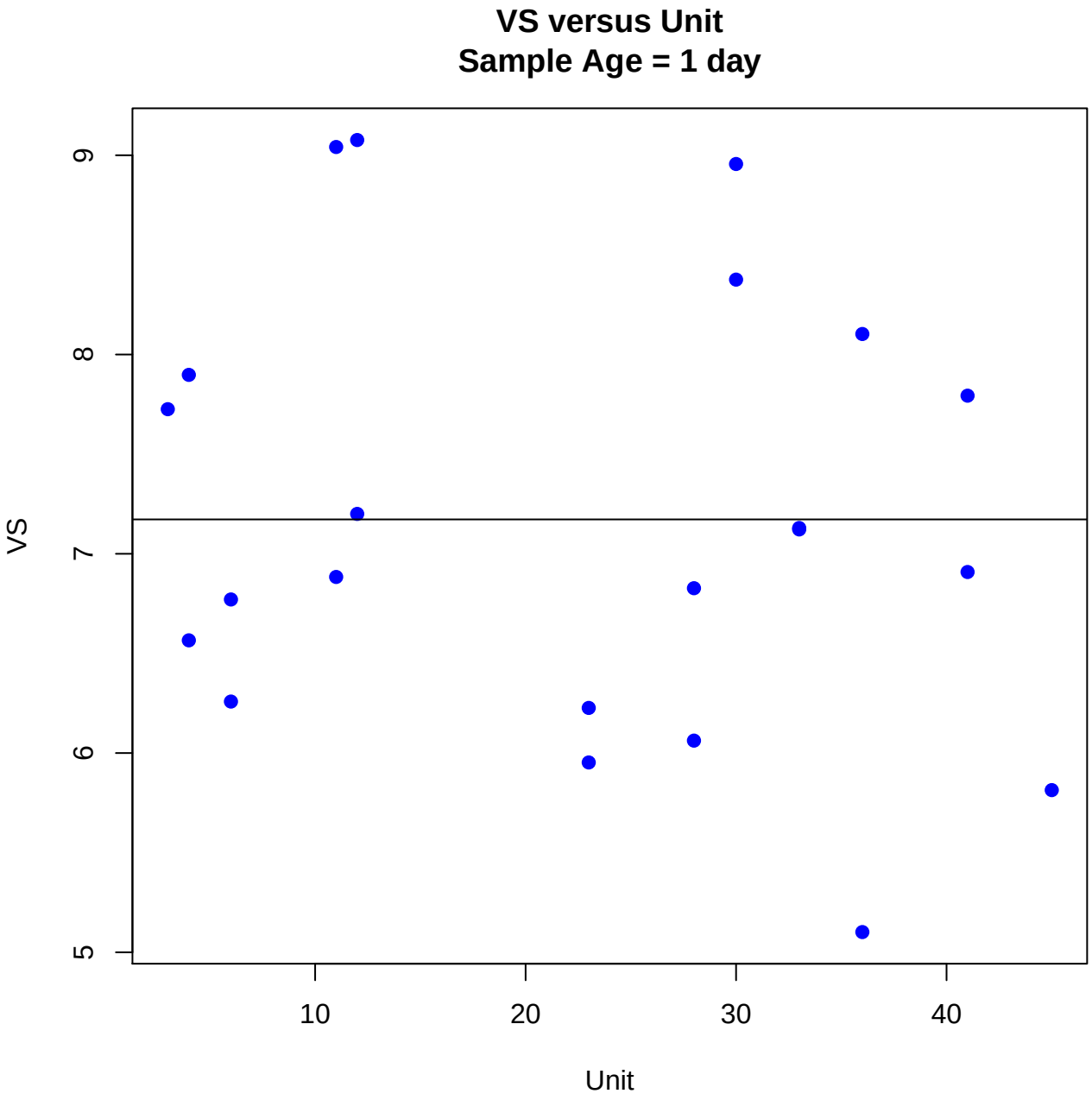

Normal Probability Plot of YS
Sample Age = 7 day
Sample Quantiles
20
22
24
26
28
30
32
−2
−1
0
1
2
Theoretical Quantiles

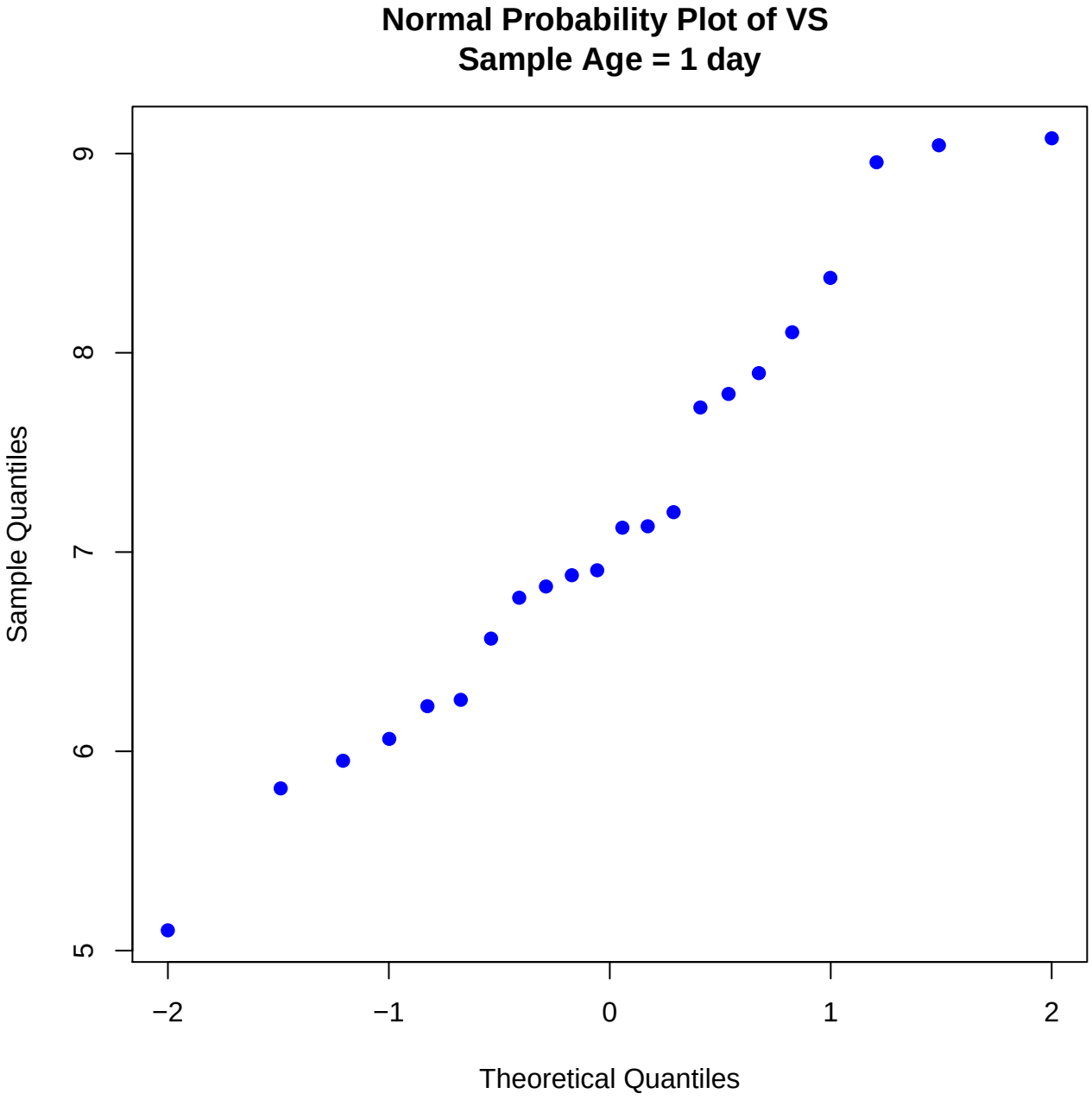

VS versus Run Order
VS
Run Order
2
4
6
8
10
5
10
15
20

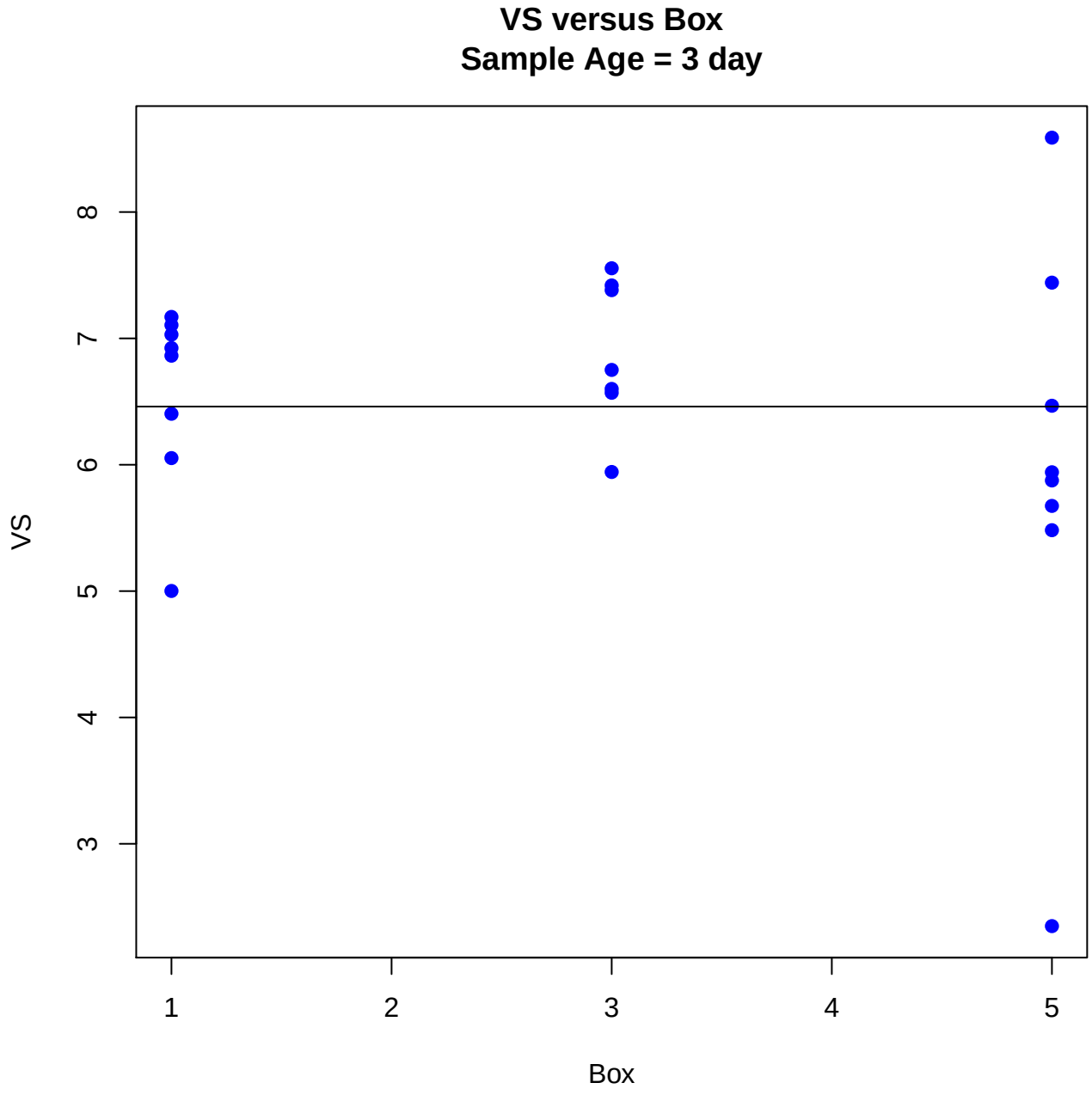

VS versus Sample Age
VS
10
8
6
4
2
1
2
3
4
5
6
7
(Sample Age)/day

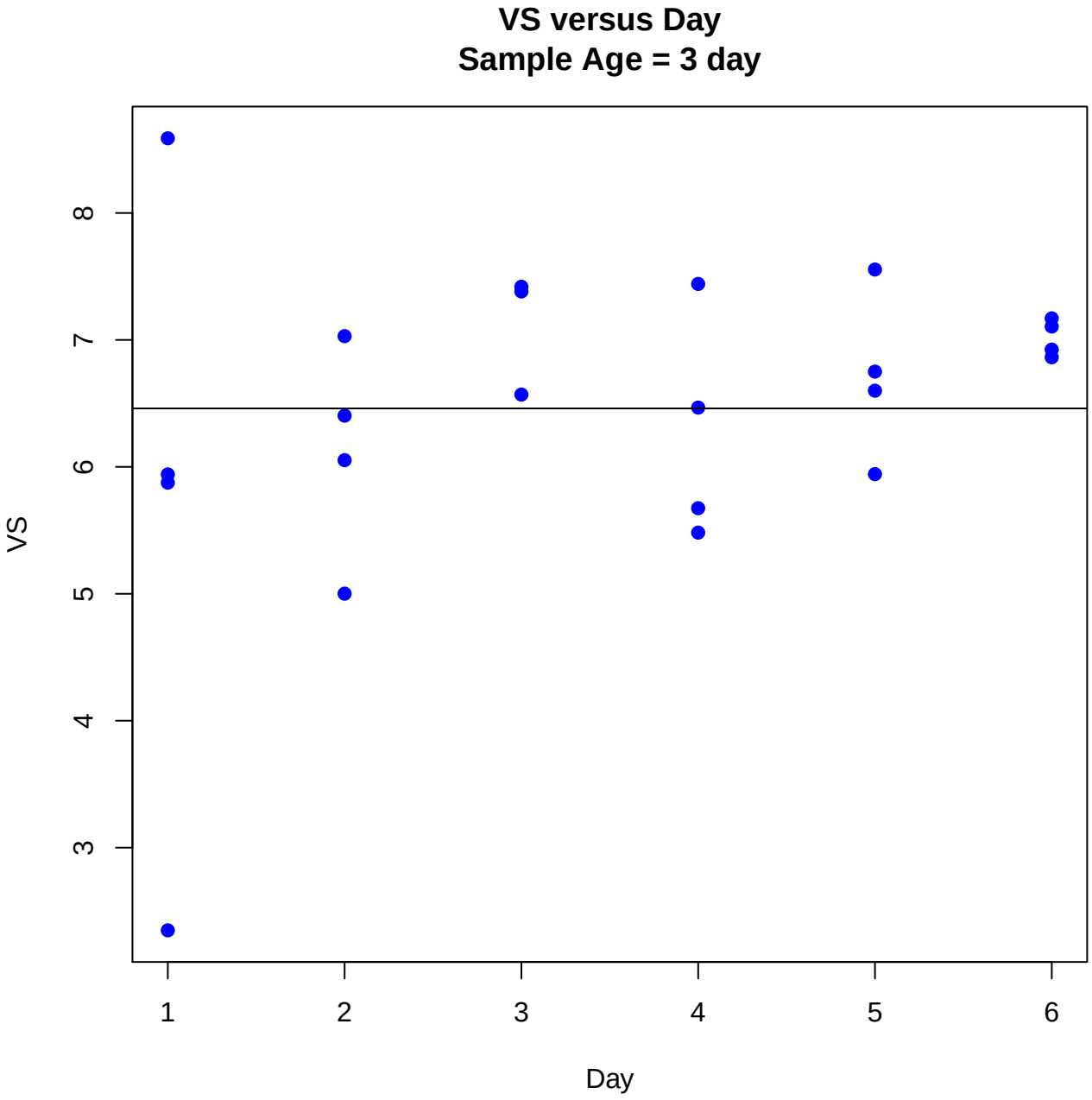

VS versus Box
Sample Age = 1 day
VS
9
8
7
6
5
1
2
3
4
5
Box

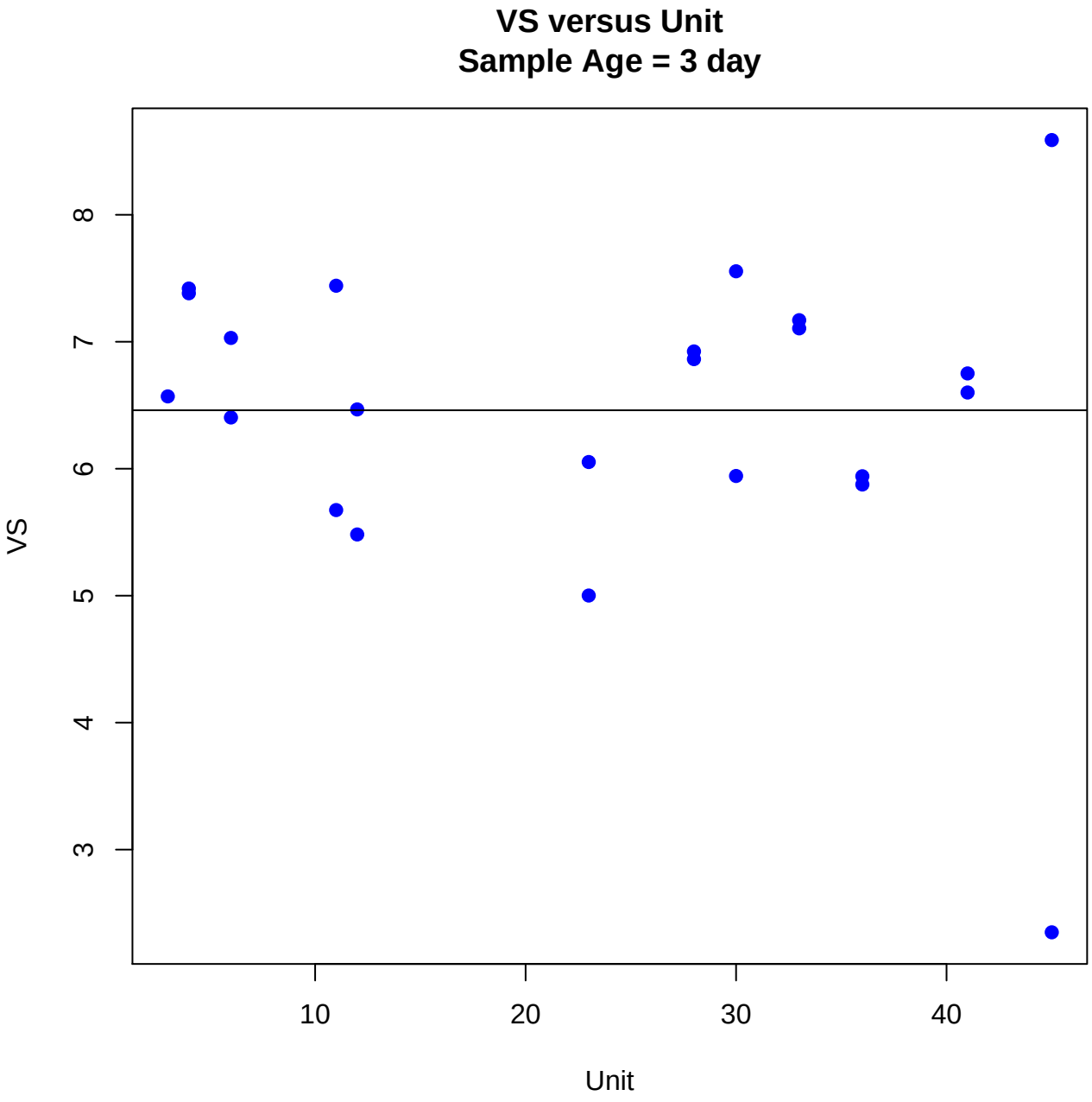

VS versus Day
Sample Age = 1 day
VS
9
8
7
6
5
1
2
3
4
5
6
Day

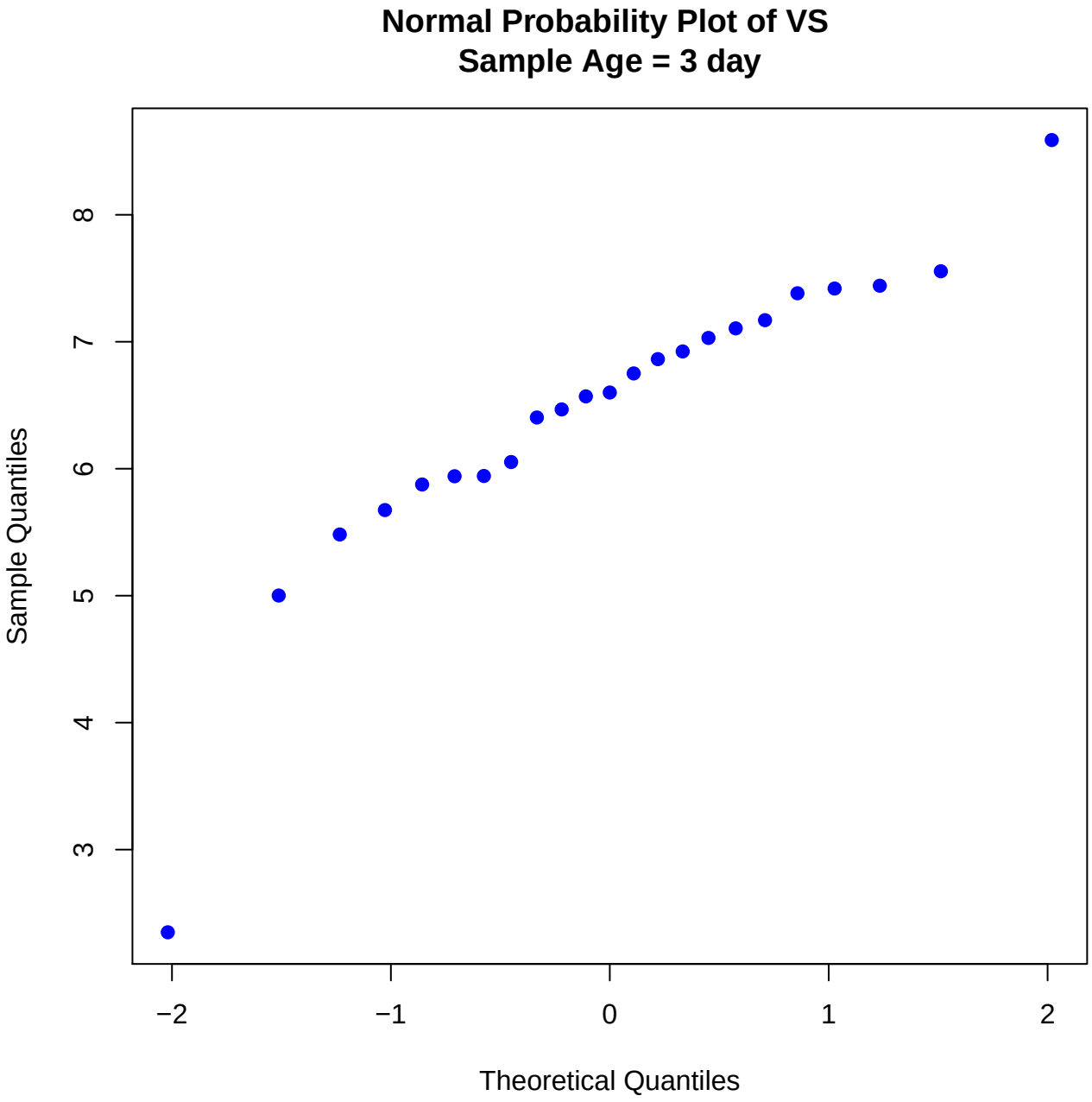

VS versus Unit
Sample Age = 1 day
VS
9
8
7
6
5
10
20
30
40
Unit

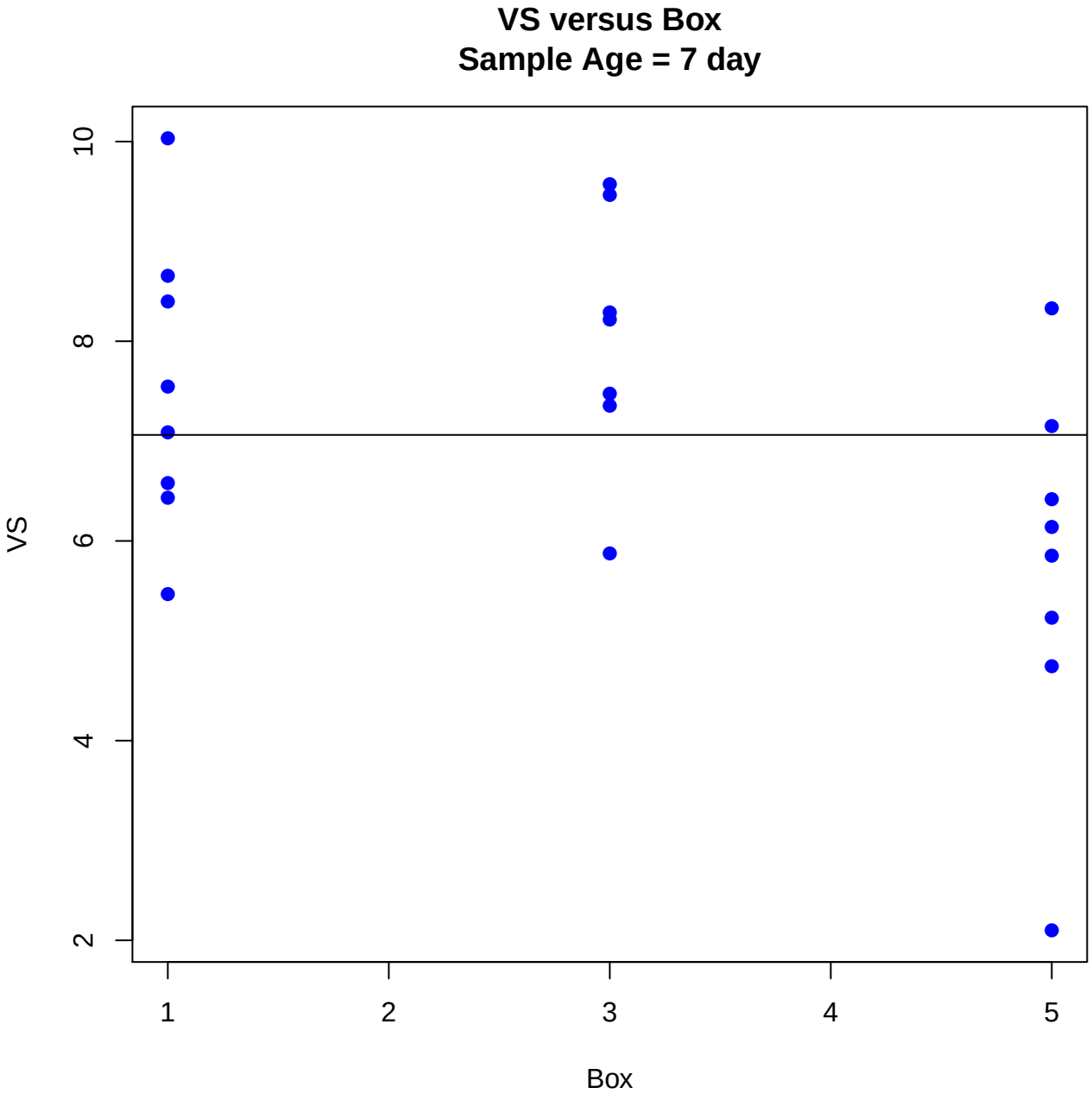

Normal Probability Plot of VS
Sample Age = 1 day
Sample Quantiles
5
6
7
8
9
−2
−1
0
1
2
Theoretical Quantiles

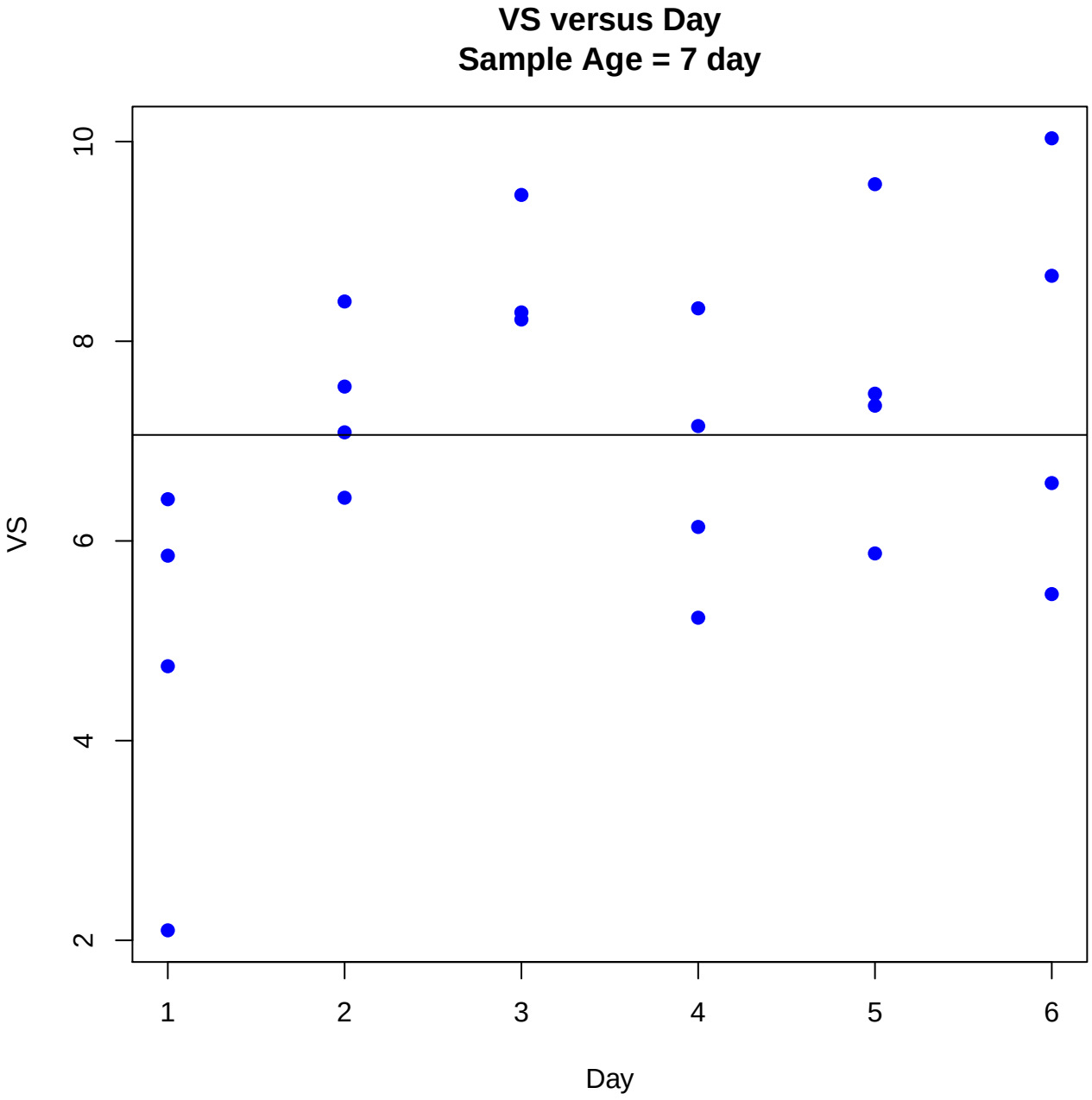

VS versus Box
Sample Age = 3 day
VS
Box
3
4
5
6
7
8
1
2
3
4
5

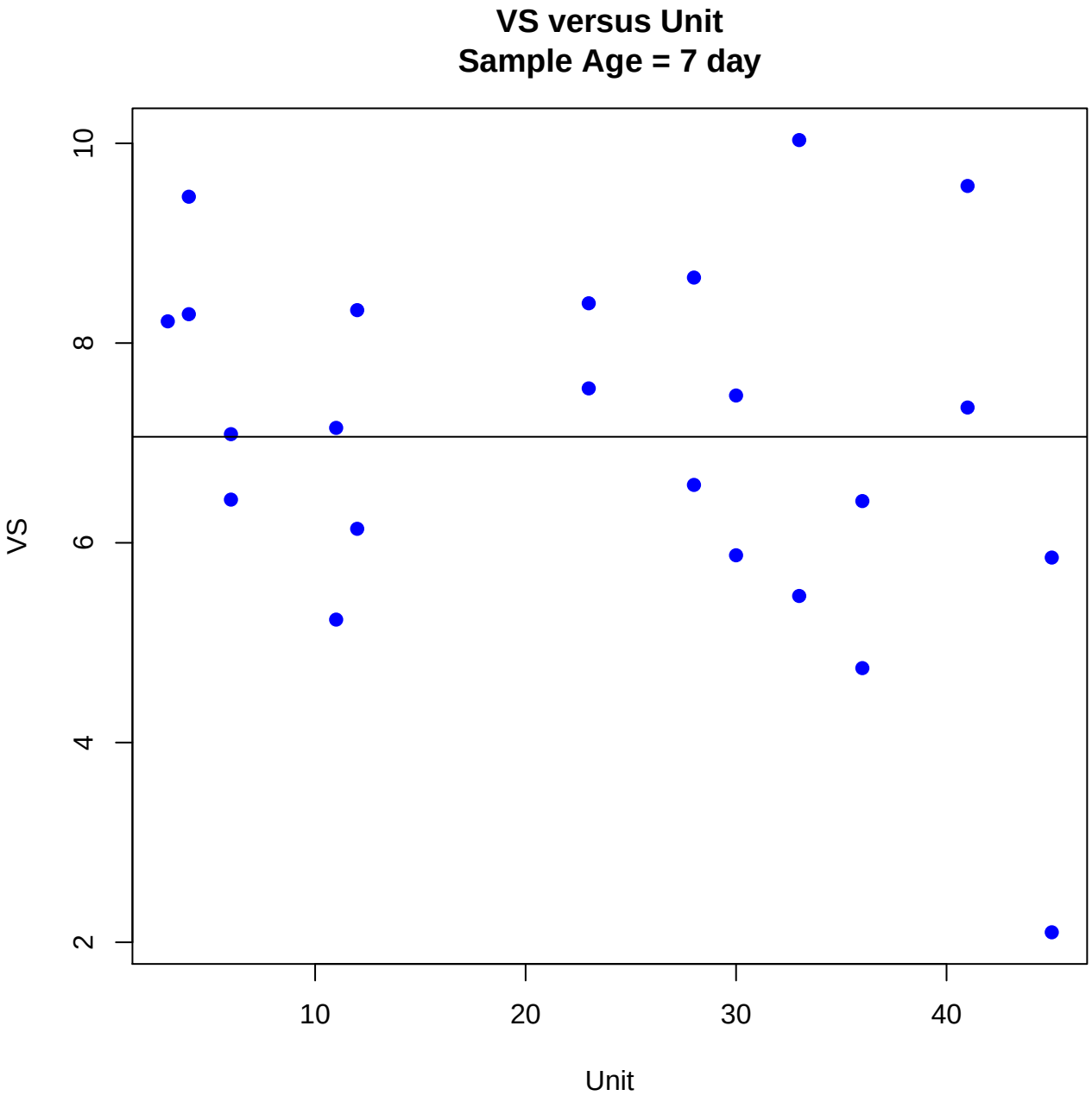

VS versus Day
Sample Age = 3 day
VS
Day
3
4
5
6
7
8
1
2
3
4
5
6

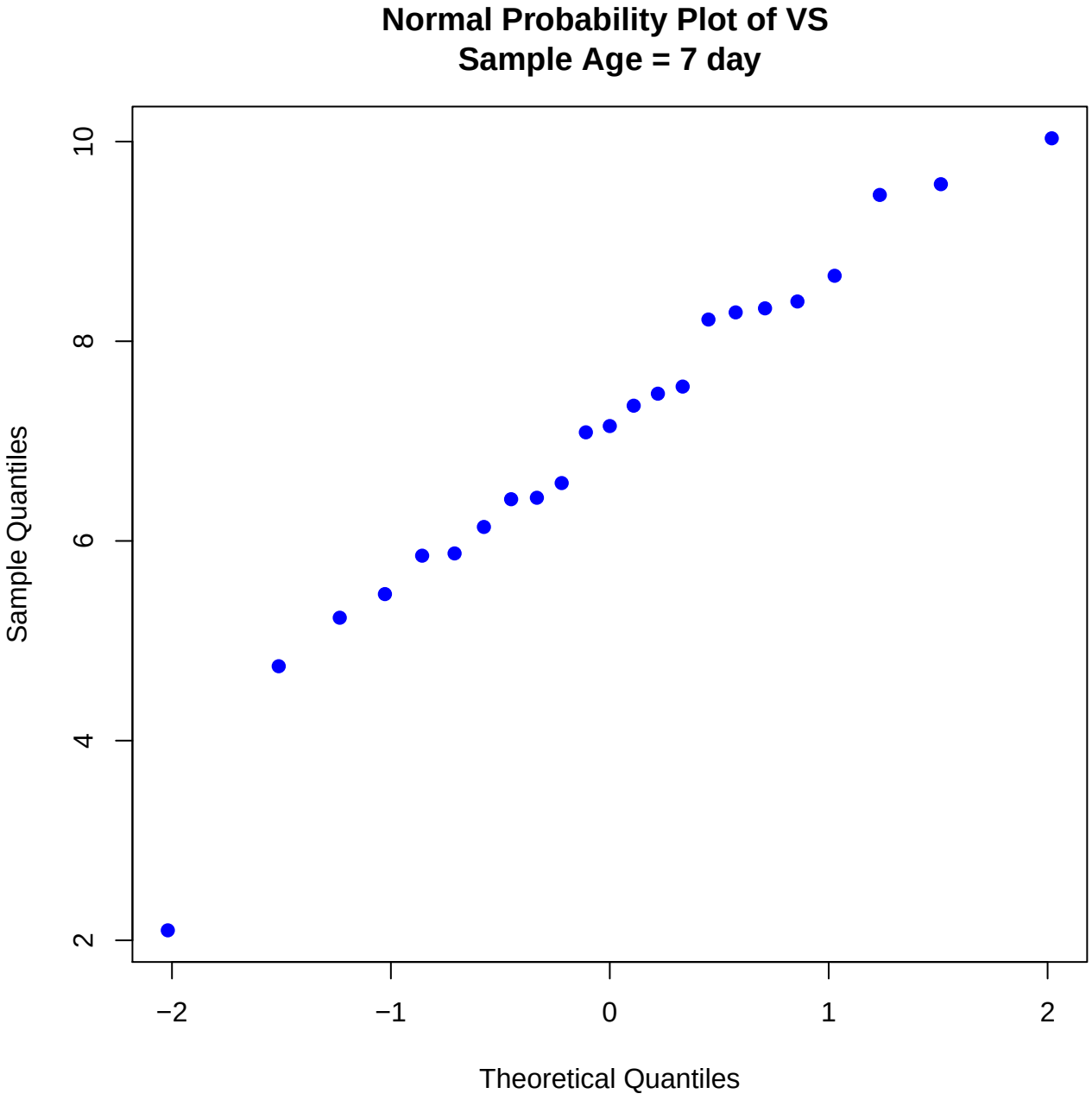

VS versus Unit
Sample Age = 3 day
VS
Unit
3
4
5
6
7
8
10
20
30
40

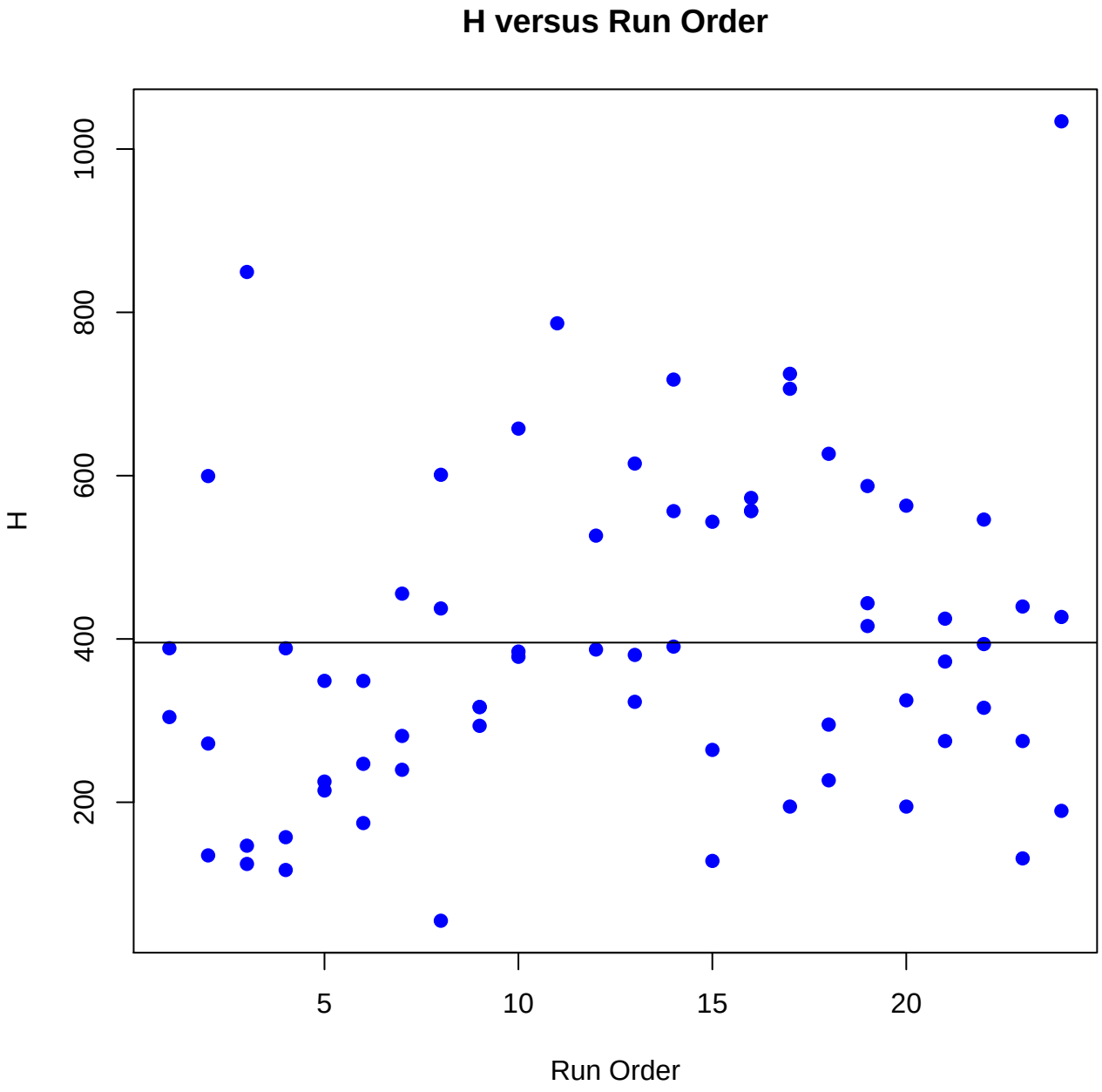

Normal Probability Plot of VS
Sample Age = 3 day
Sample Quantiles
3
4
5
6
7
8
−2
−1
0
1
2
Theoretical Quantiles

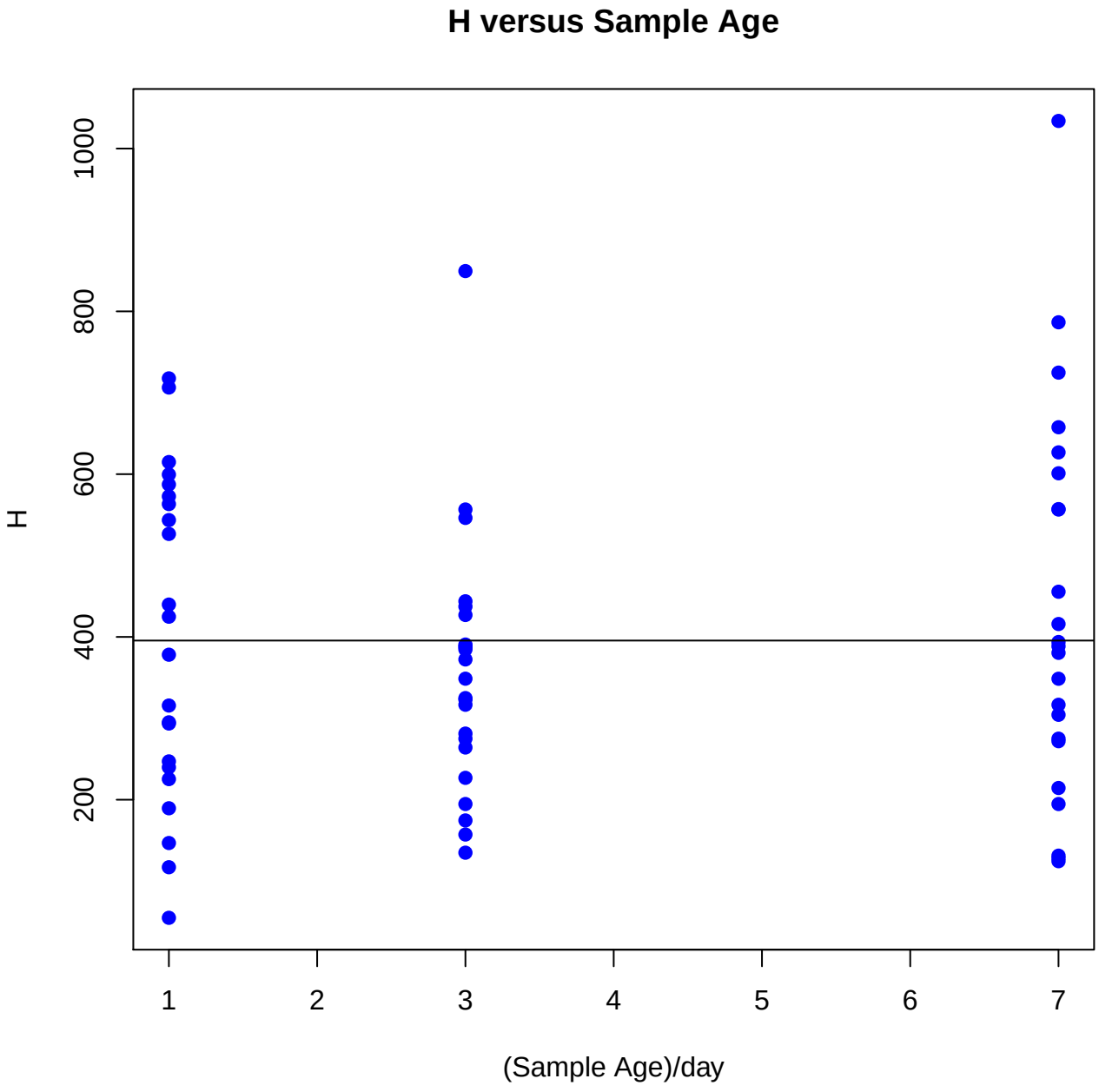

VS versus Box
Sample Age = 7 day
VS
10
8
6
4
2
1
2
3
4
5
Box

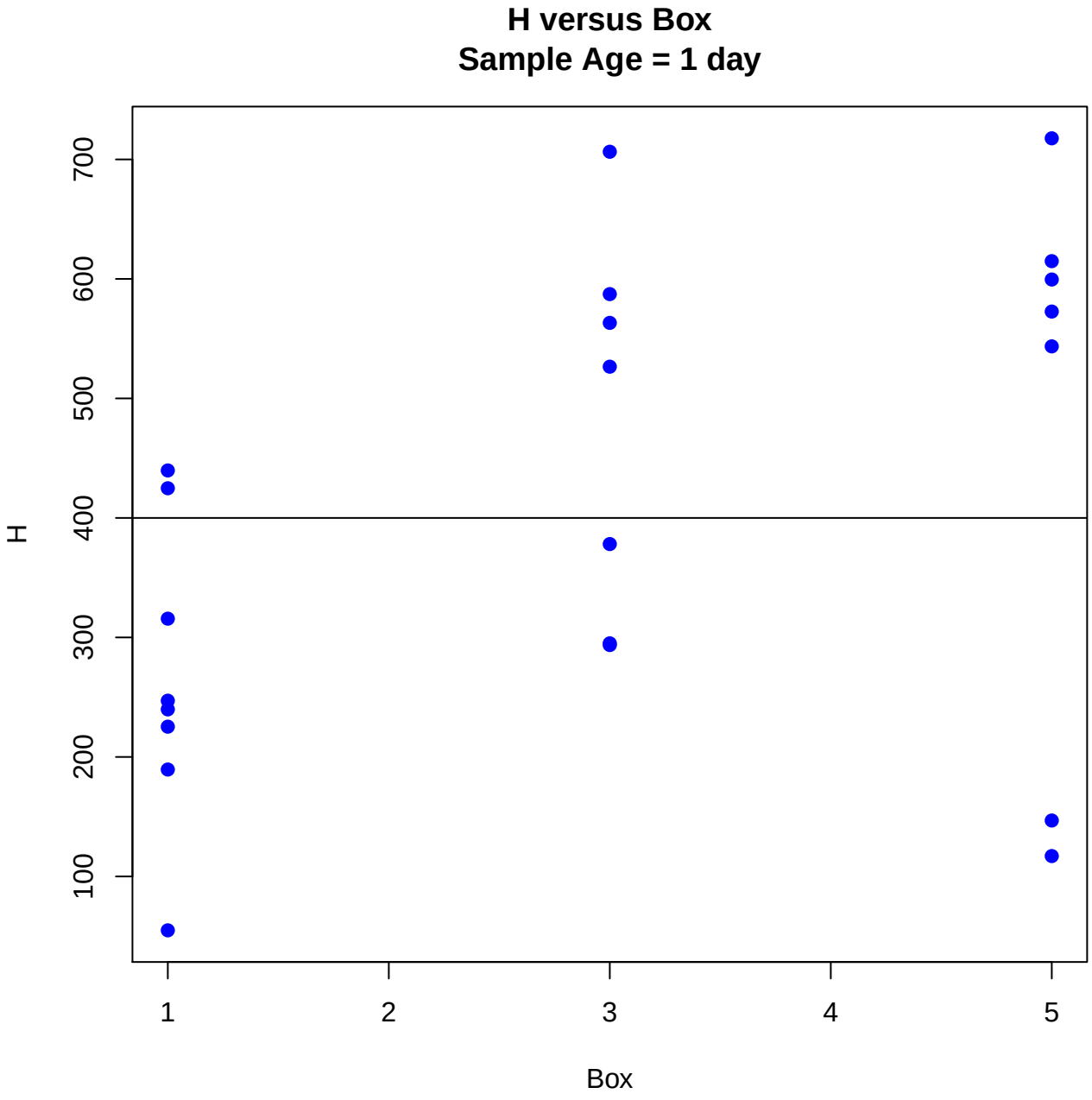

VS versus Day
Sample Age = 7 day
VS
10
8
6
4
2
1
2
3
4
5
6
Day

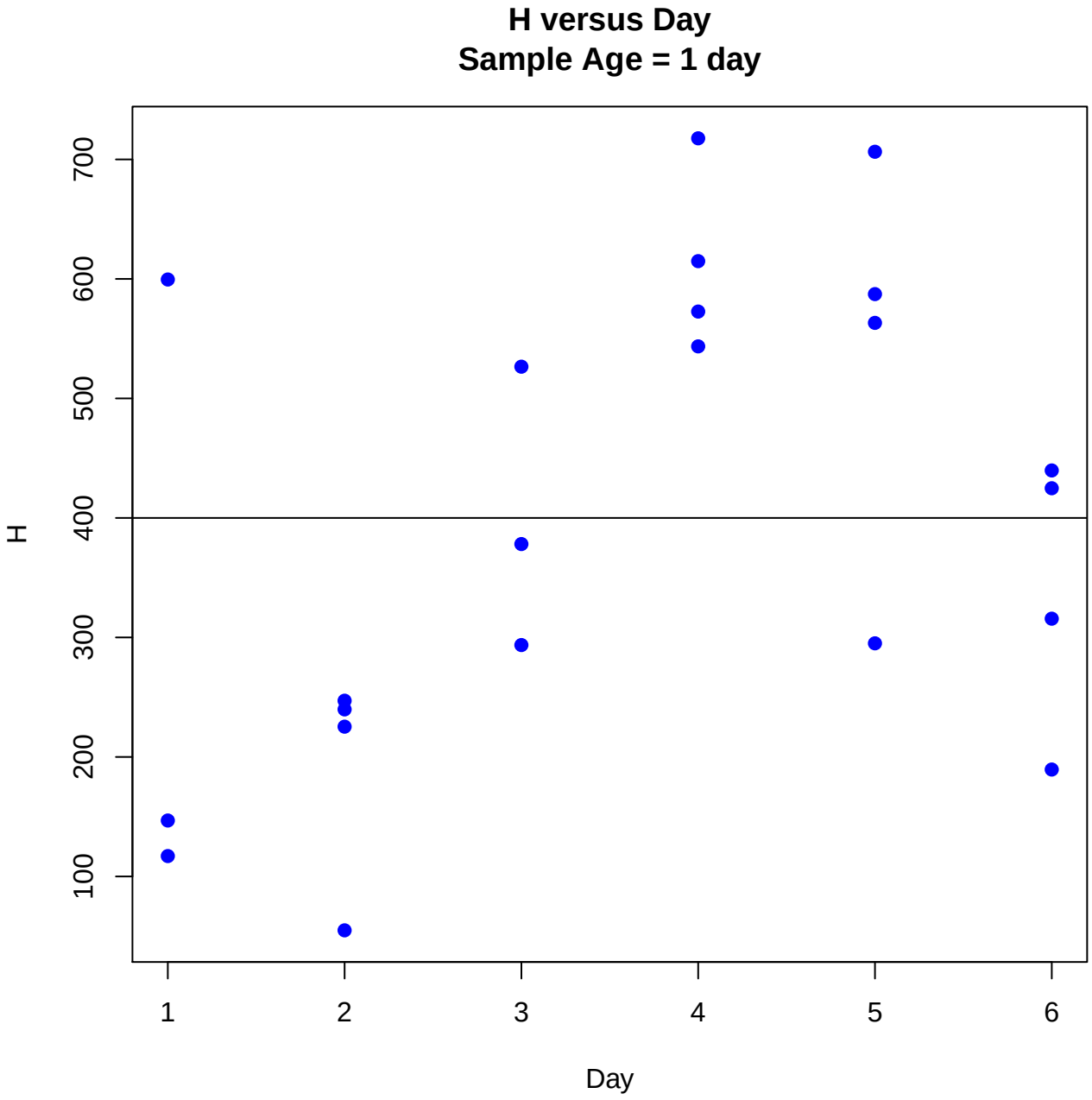

VS versus Unit
Sample Age = 7 day
VS
Unit
2
4
6
8
10
10
20
30
40

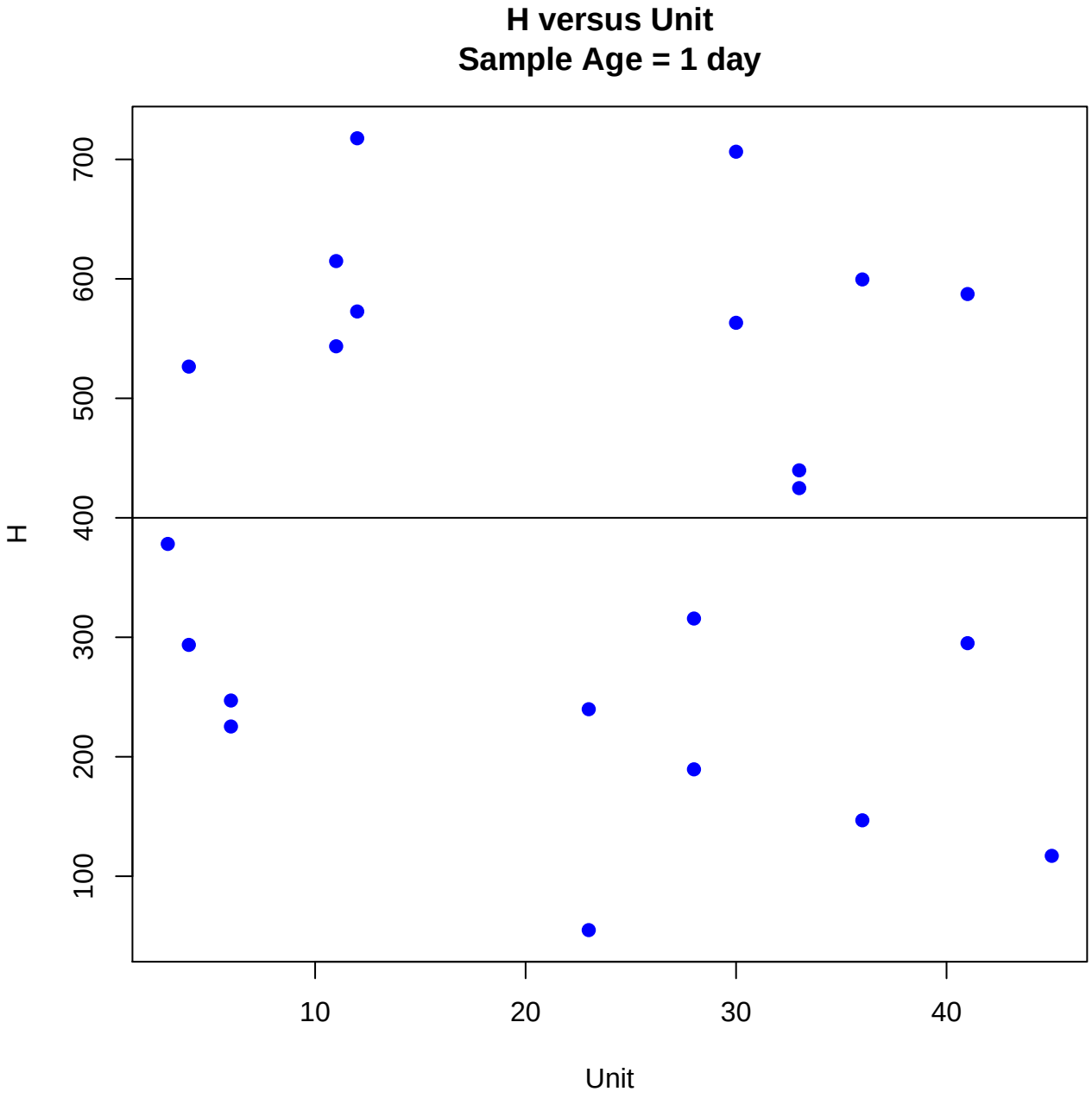

Normal Probability Plot of VS
Sample Age = 7 day
Sample Quantiles
Theoretical Quantiles
2
4
6
8
10
−2
−1
0
1
2

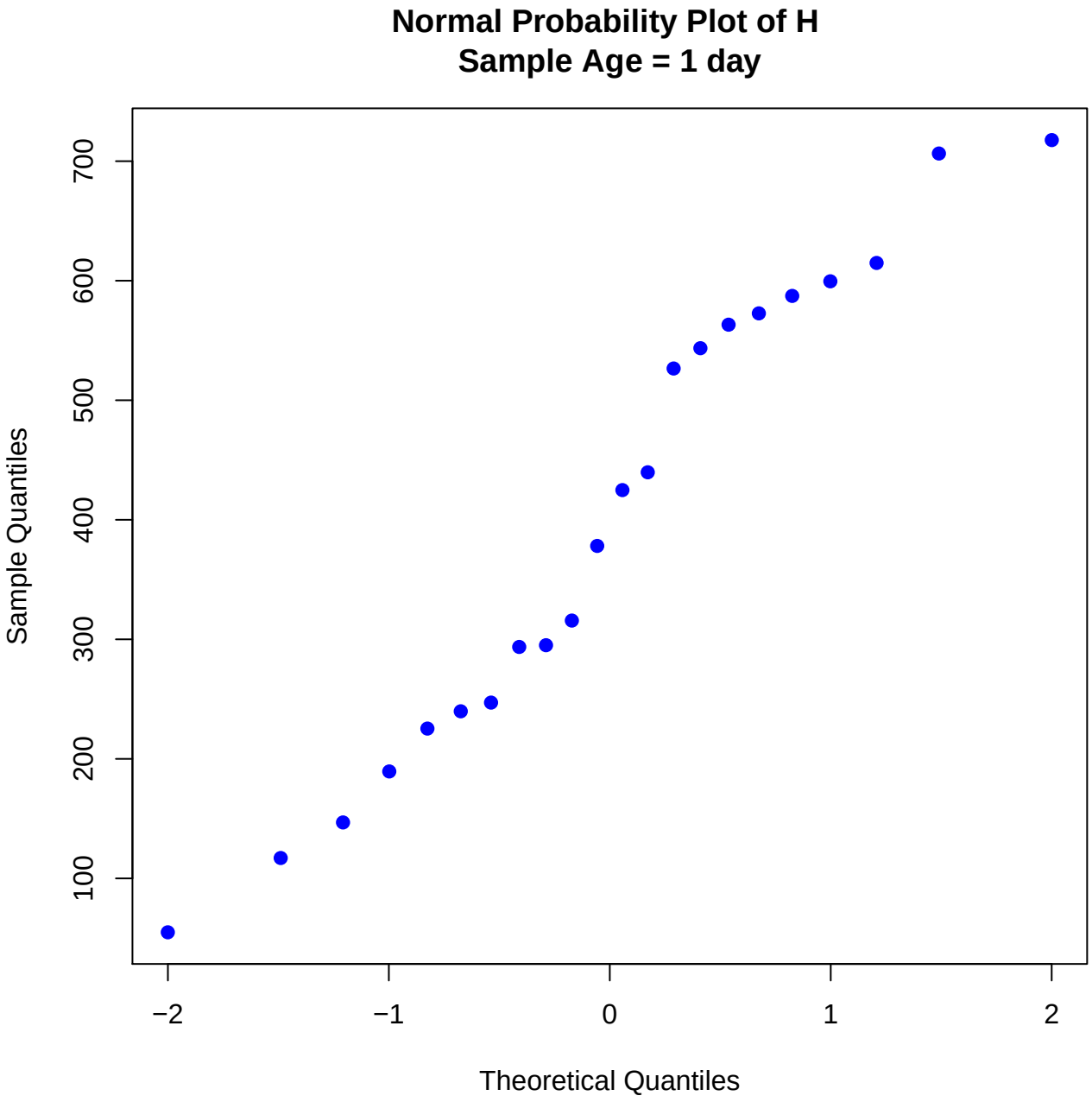

H versus Run Order
H
1000
800
600
400
200
5
10
15
20
Run Order

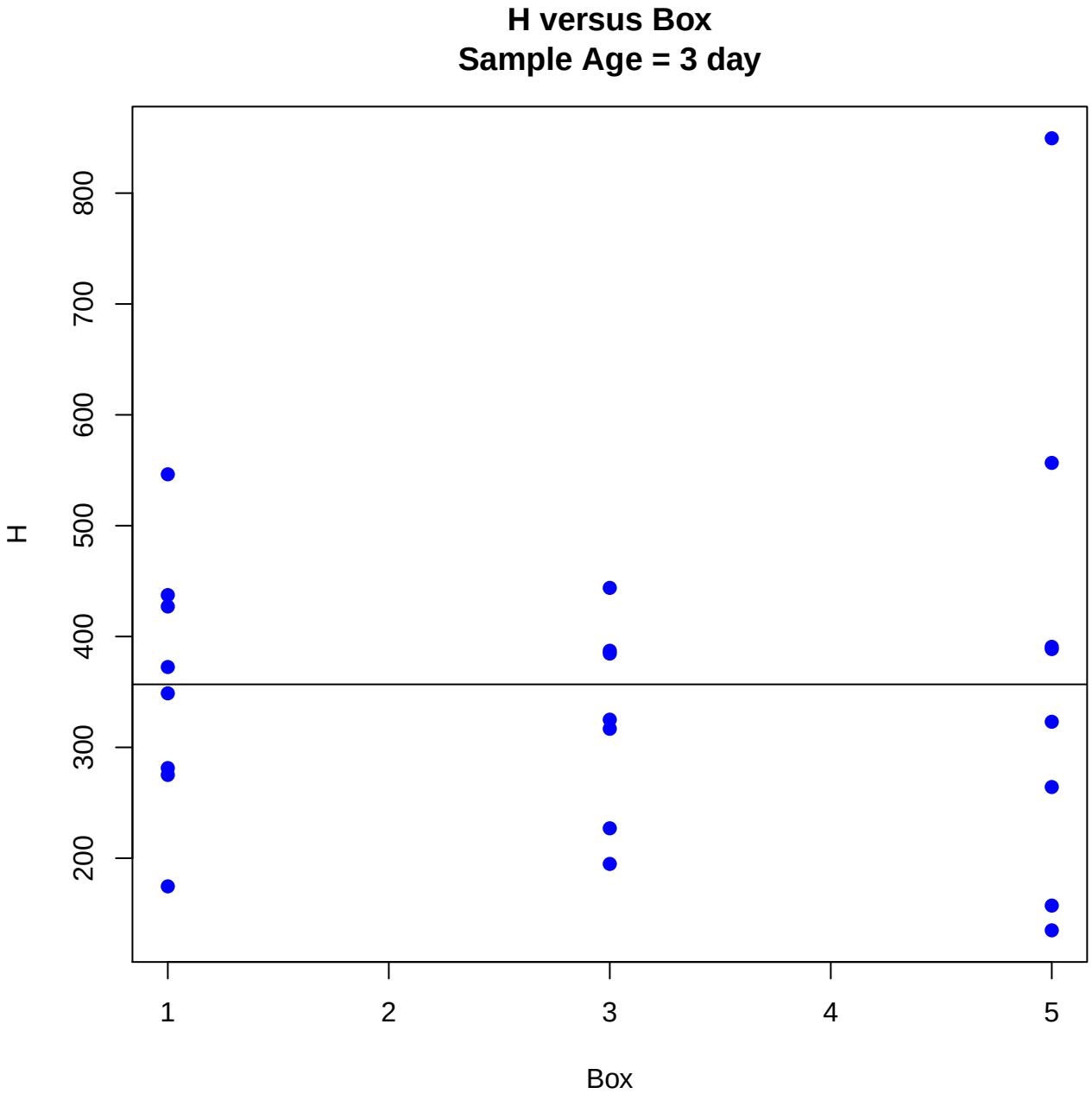

H versus Sample Age
H
200
400
600
800
1000
1
2
3
4
5
6
7
(Sample Age)/day

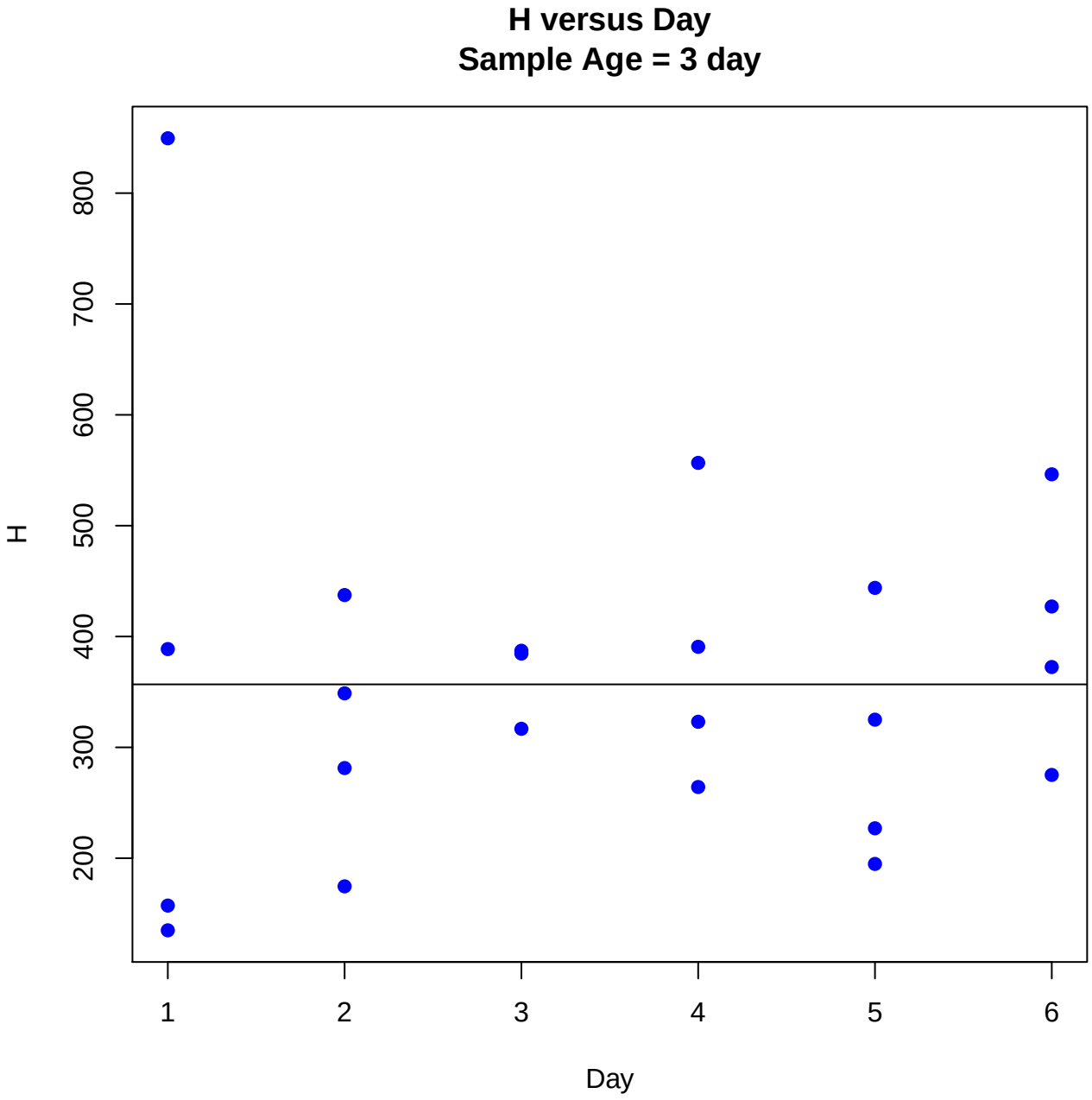

H versus Box
Sample Age = 1 day
H
100
200
300
400
500
600
700
1
2
3
4
5
Box

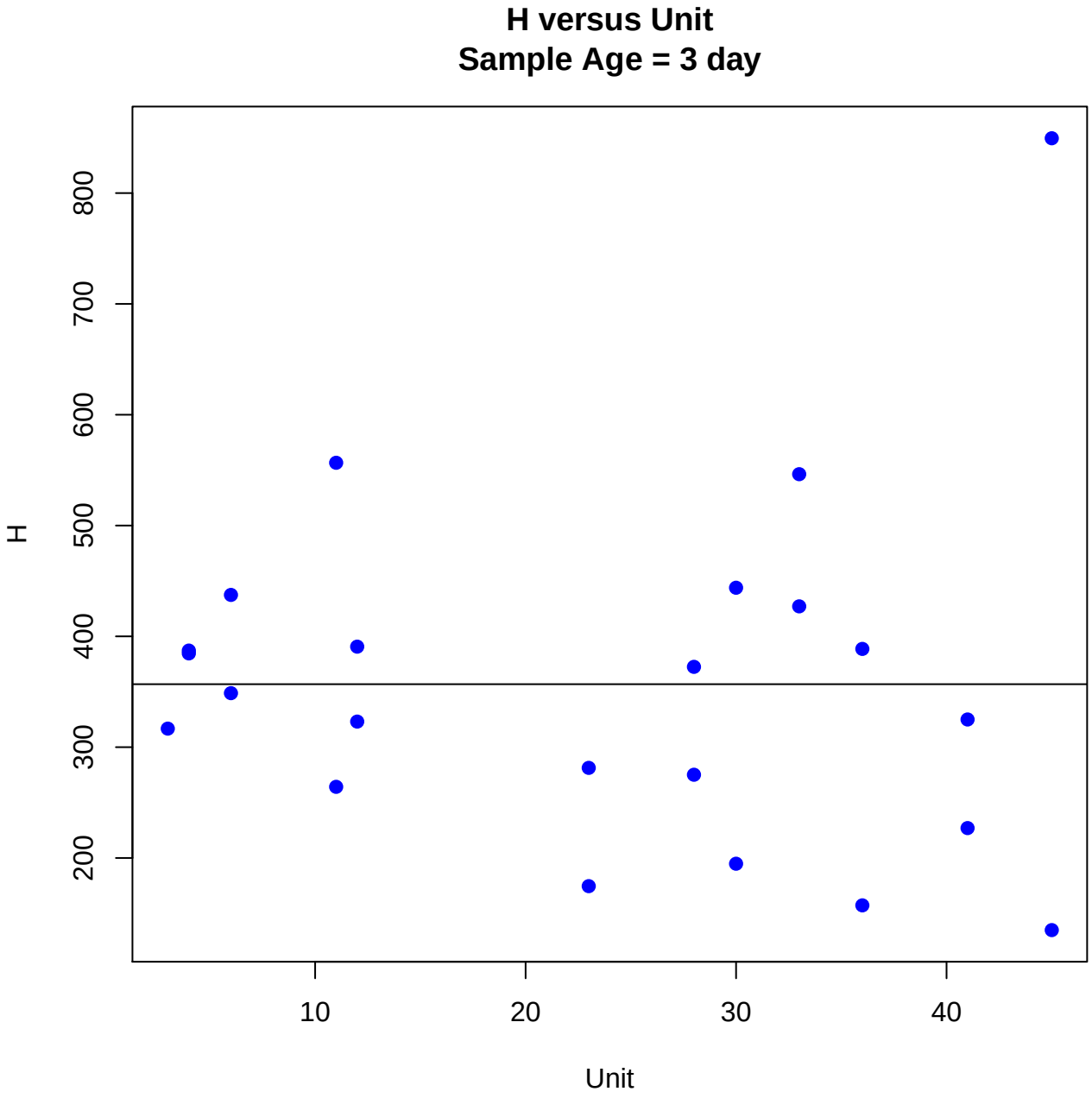

H versus Day
Sample Age = 1 day
H
100
200
300
400
500
600
700
1
2
3
4
5
6
Day

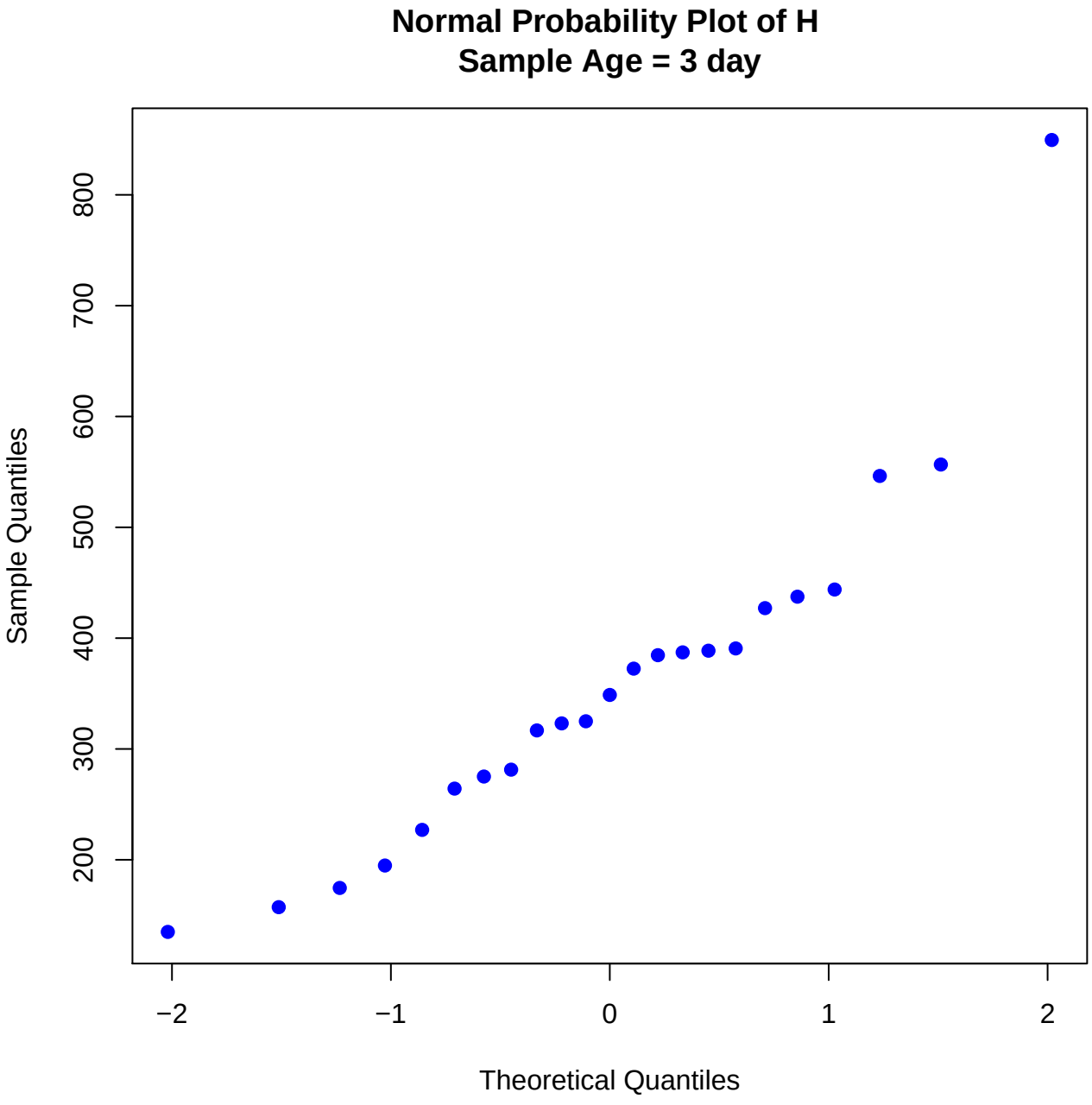

H versus Unit
Sample Age = 1 day
H
100
200
300
400
500
600
700
10
20
30
40
Unit

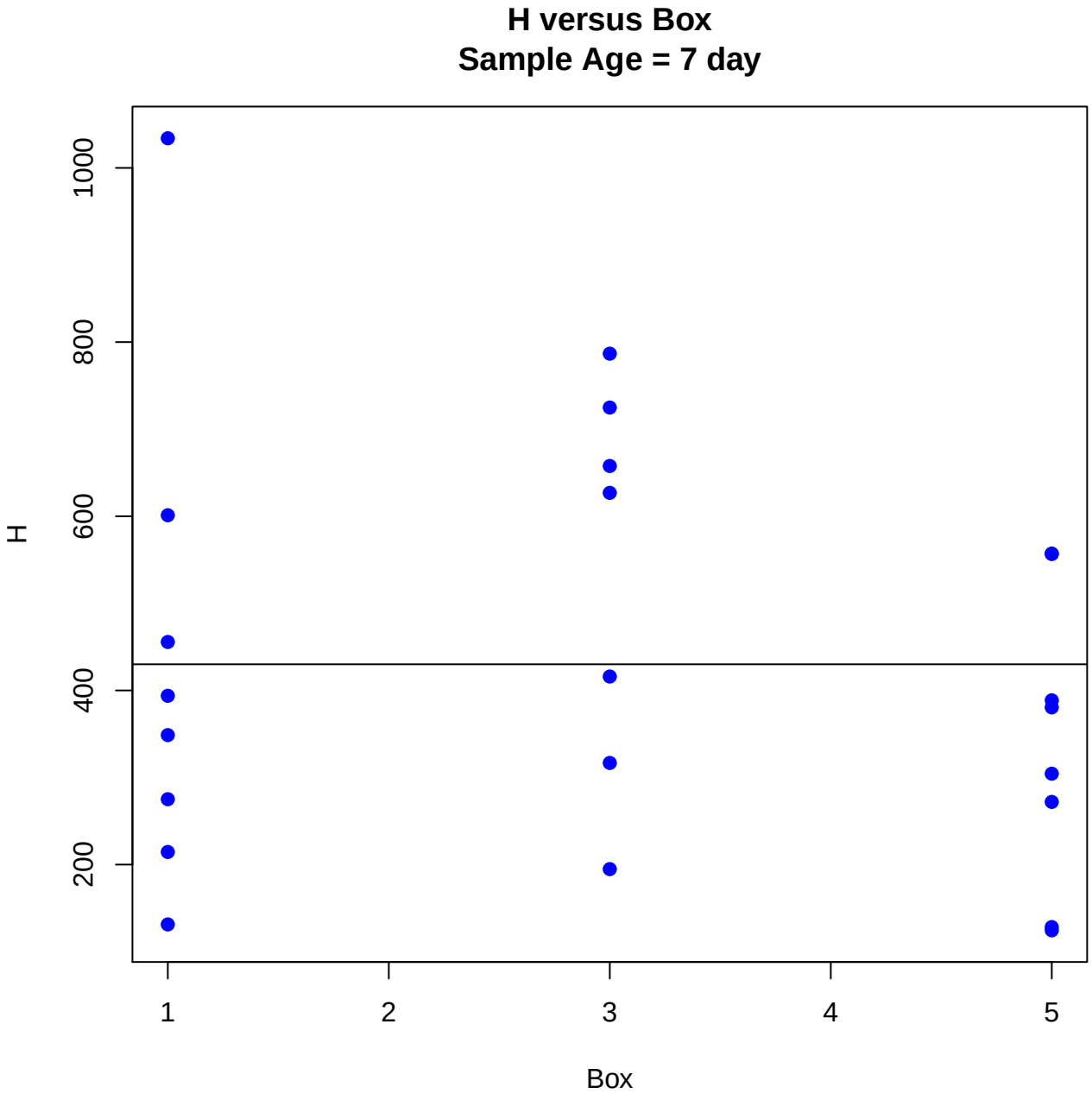

Normal Probability Plot of H
Sample Age = 1 day
Sample Quantiles
100
200
300
400
500
600
700
−2
−1
0
1
2
Theoretical Quantiles

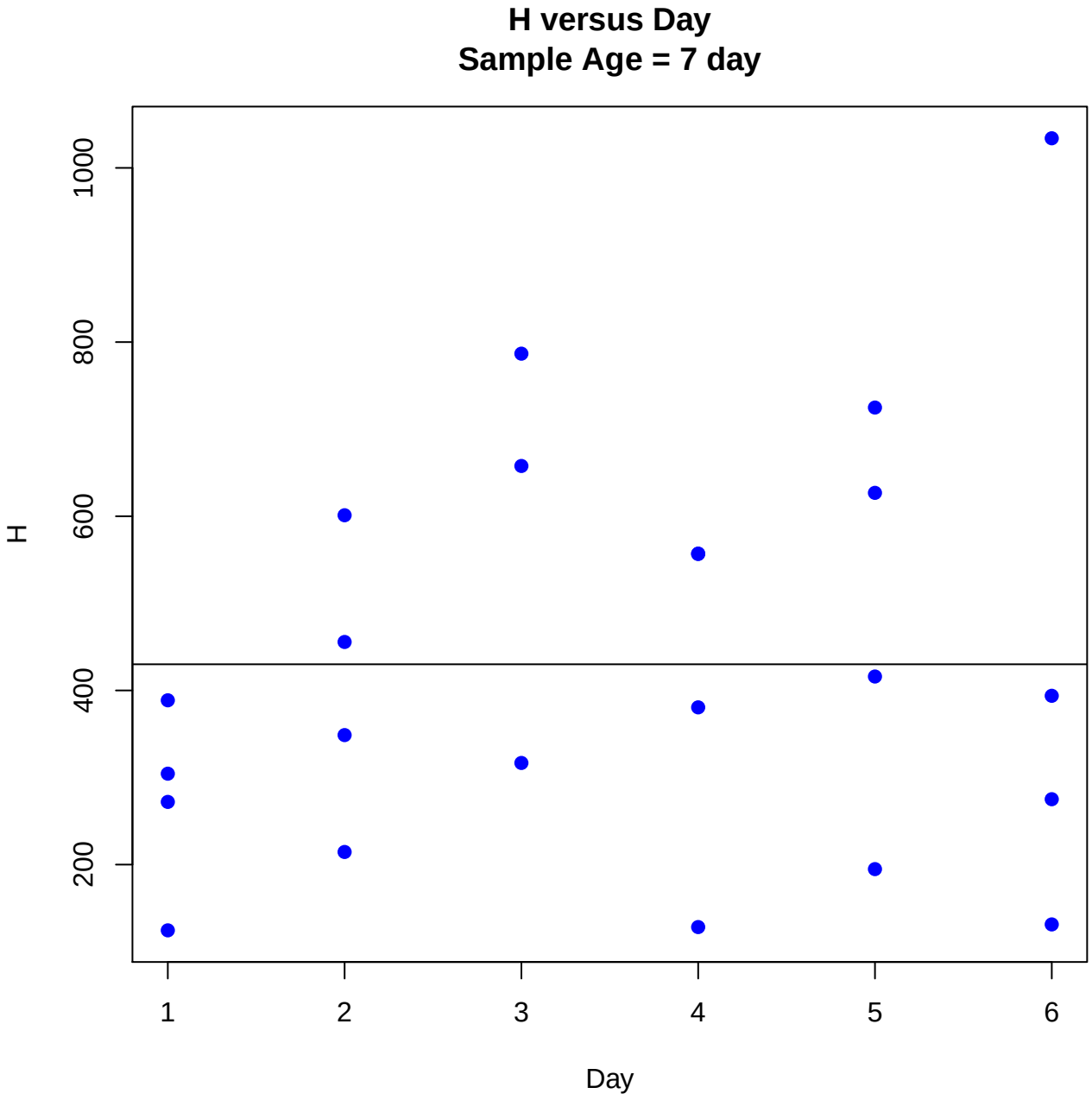

H versus Box
Sample Age = 3 day
H
200
300
400
500
600
700
800
1
2
3
4
5
Box

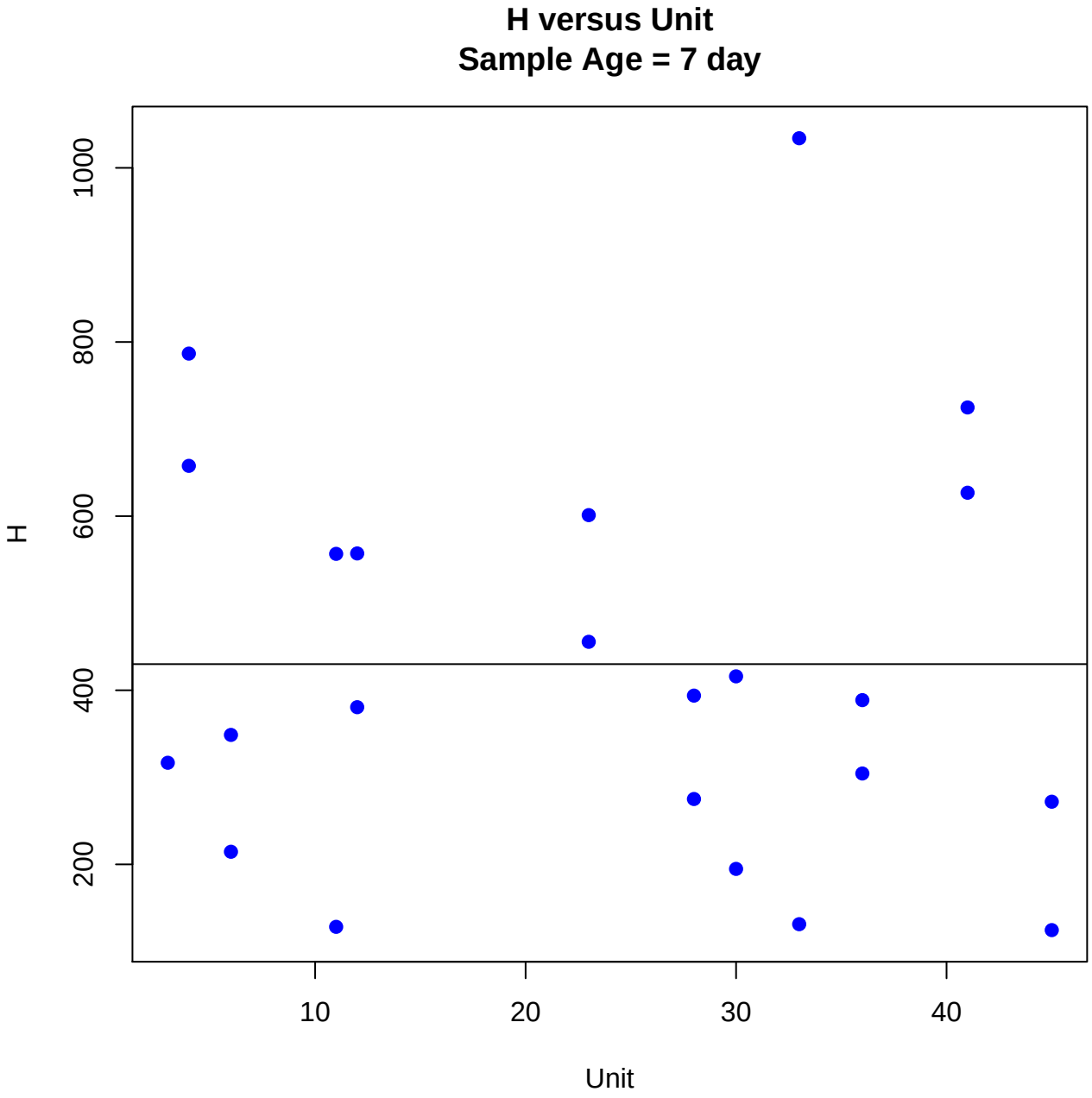

H versus Day
Sample Age = 3 day
H
200
300
400
500
600
700
800
1
2
3
4
5
6
Day

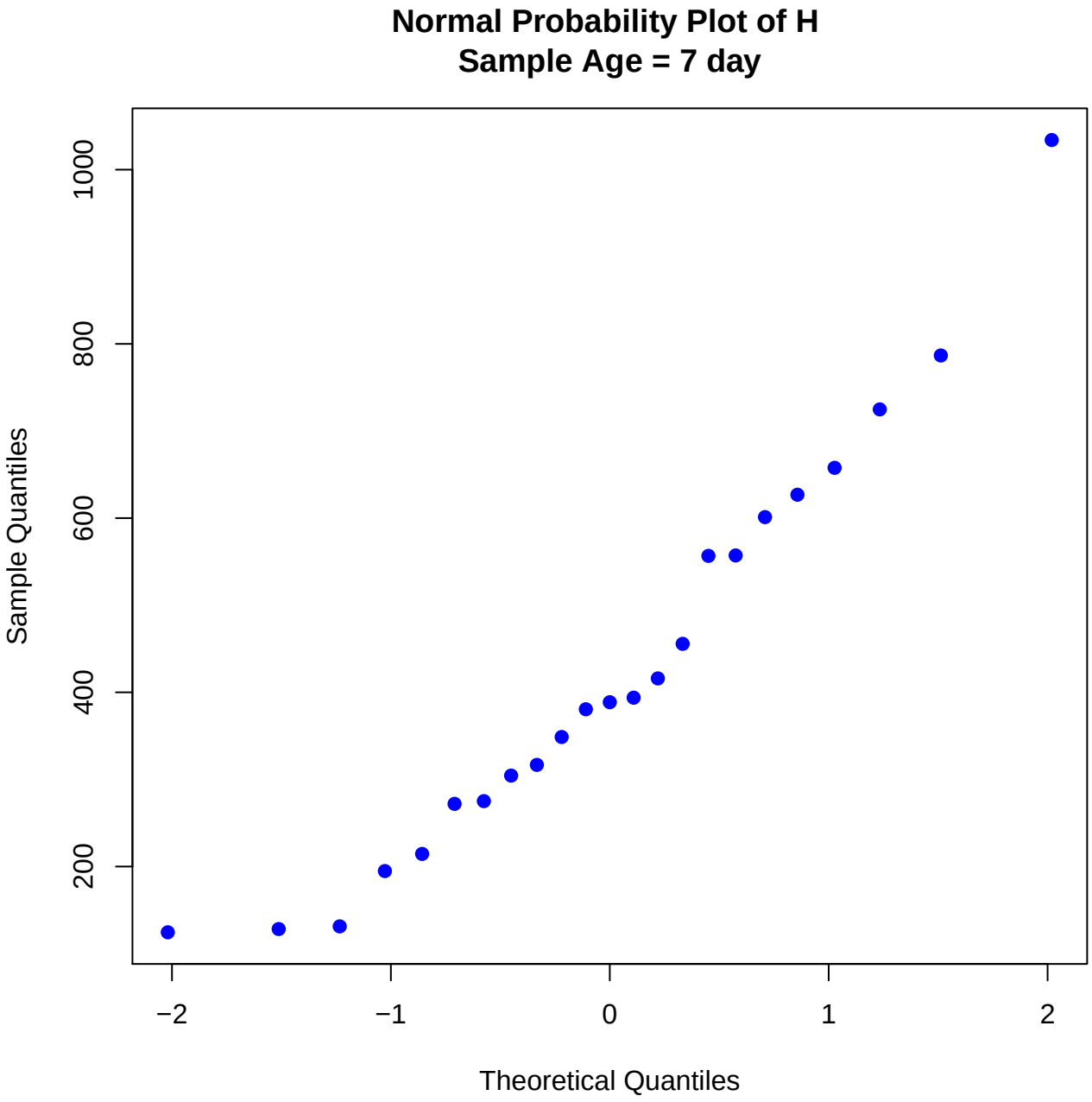

H versus Unit
Sample Age = 3 day
H
200
300
400
500
600
700
800
10
20
30
40
Unit


Normal Probability Plot of H
Sample Age = 3 day
Sample Quantiles
200
300
400
500
600
700
800
−2
−1
0
1
2
Theoretical Quantiles


H versus Box
Sample Age = 7 day
H
1000
800
600
400
200
1
2
3
4
5
Box

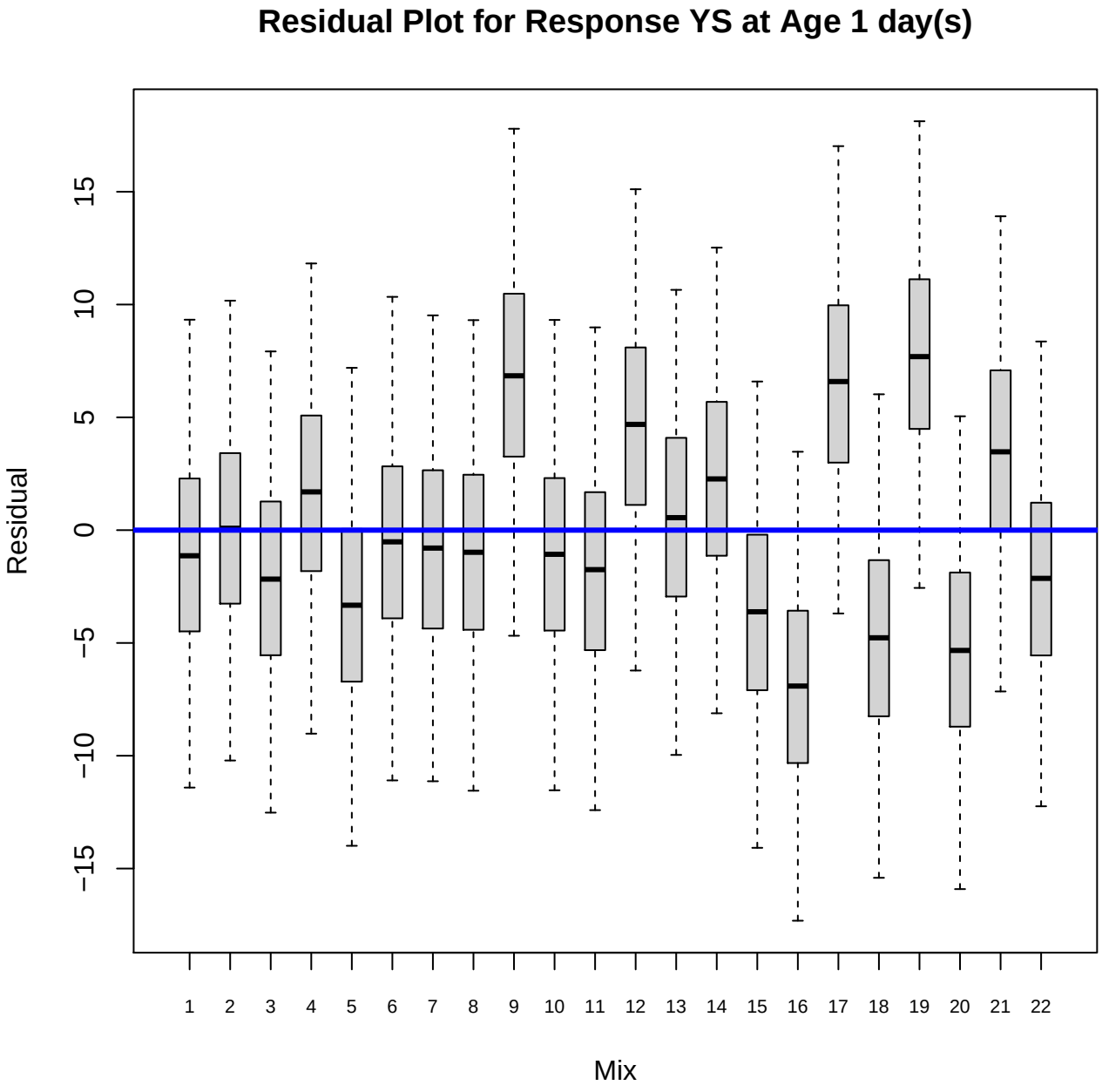

H versus Day
Sample Age = 7 day
H
1000
800
600
400
200
1
2
3
4
5
6
Day

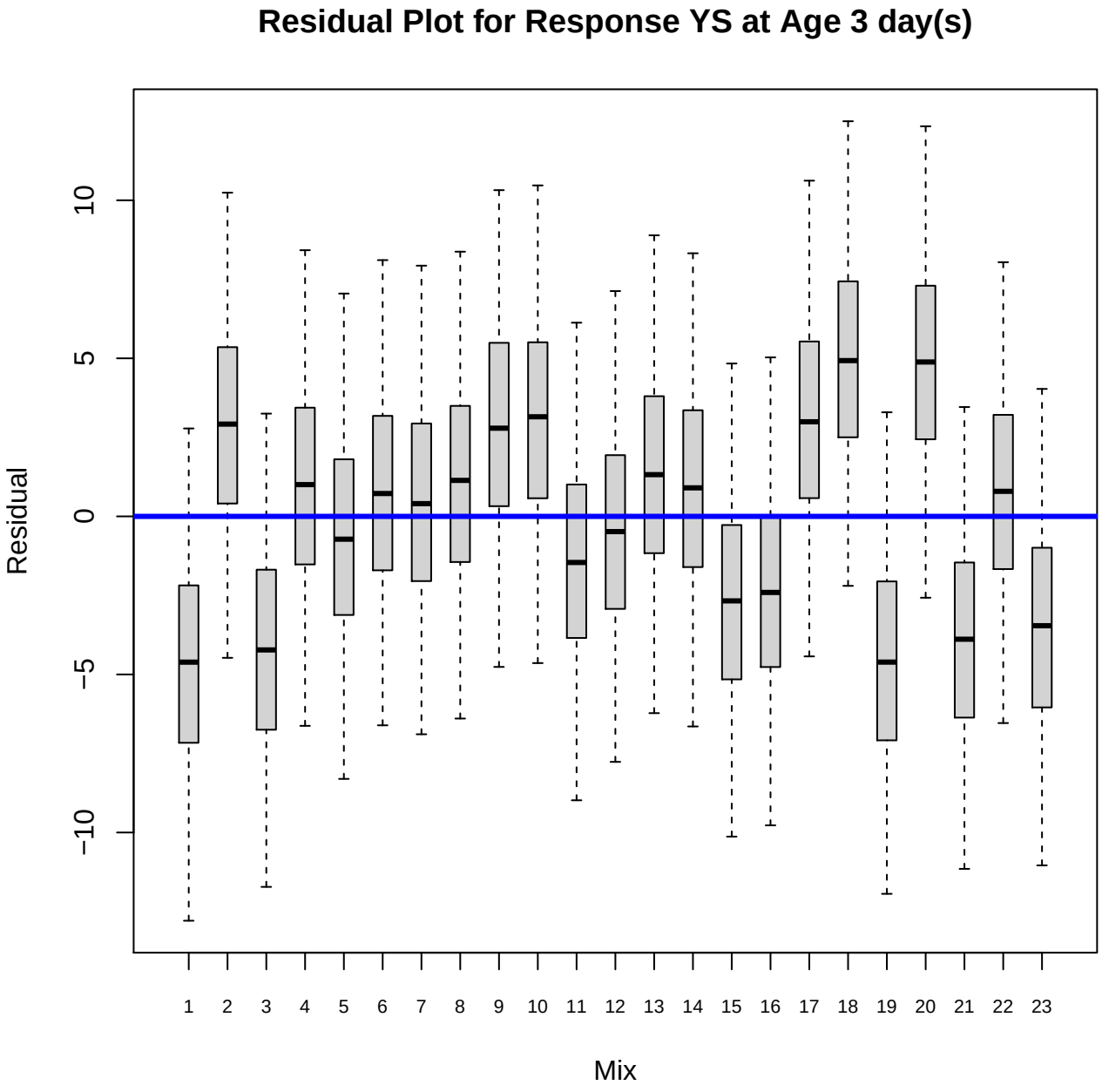

H versus Unit
Sample Age = 7 day
H
1000
800
600
400
200
10
20
30
40
Unit

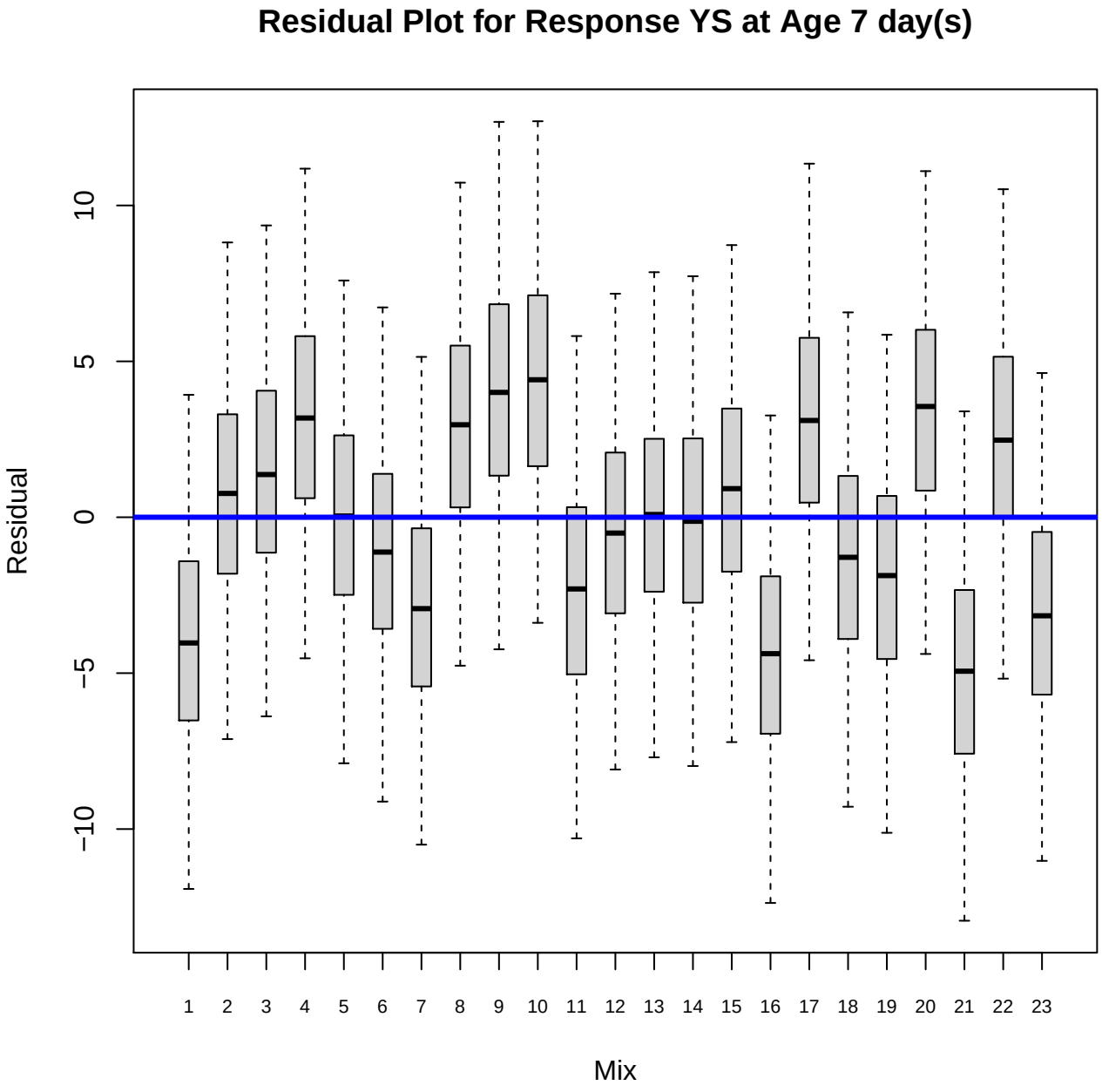

Normal Probability Plot of H
Sample Age = 7 day
Sample Quantiles
200
400
600
800
1000
−2
−1
0
1
2
Theoretical Quantiles

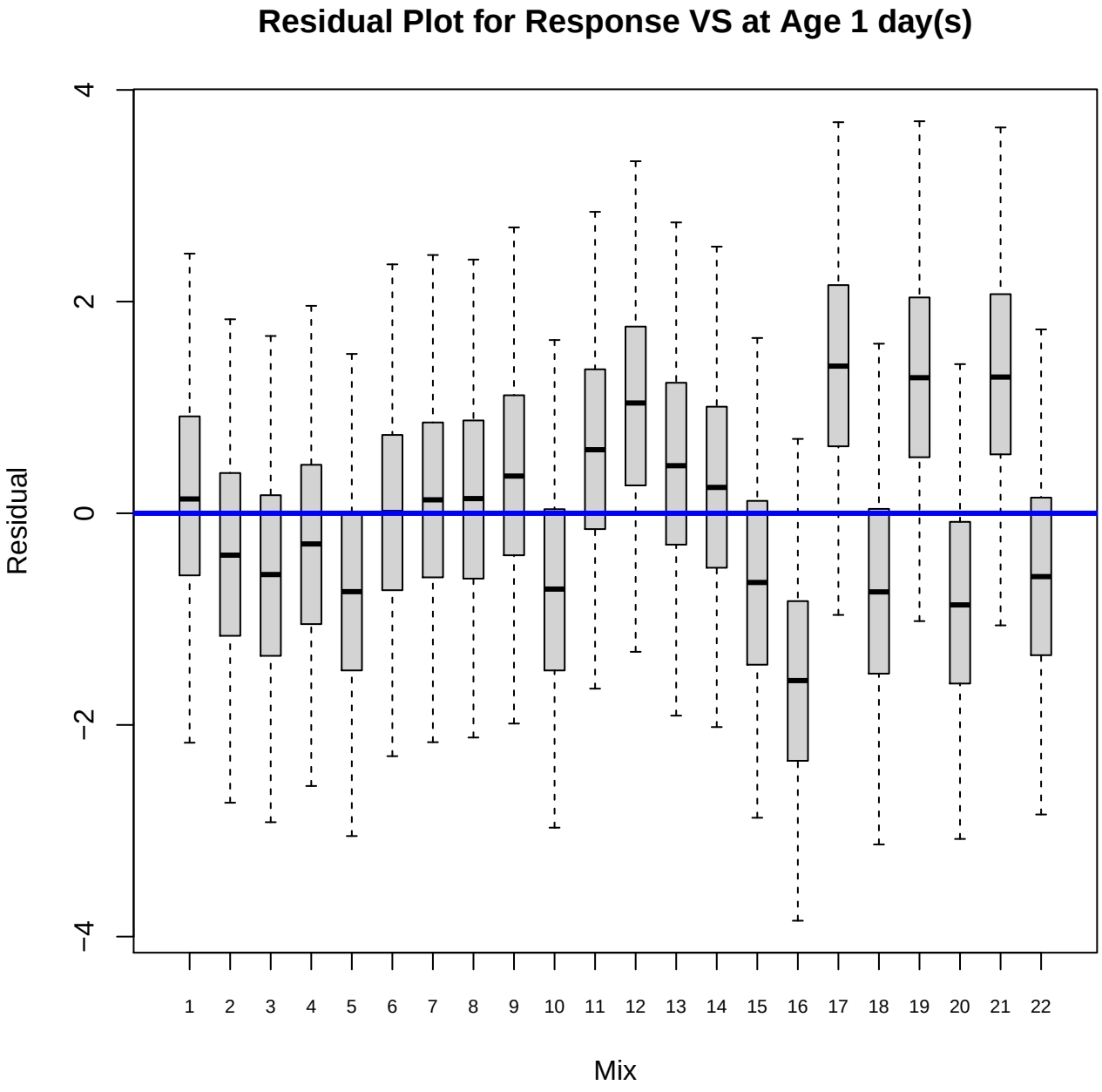
WinBUGS Implementation of Hierarchical Model for Certification of Rheological Quantities in SRM 2492

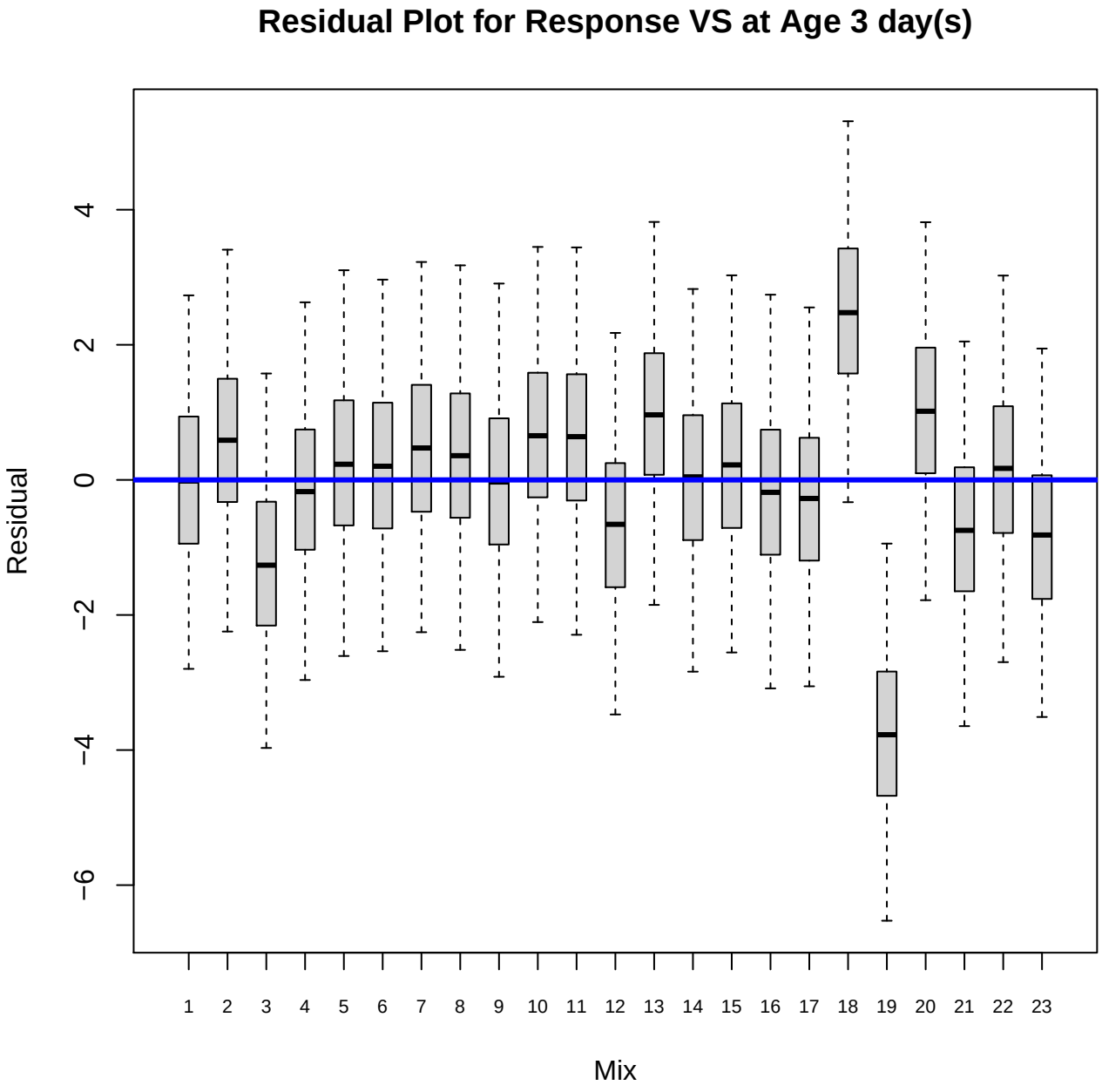
```
model
{
mu~dunif(-1000,1000)
sigma.day~dunif(0,1000)
sigma.btl~dunif(0,1000)
sigma.rme~dunif(0,1000)
tau.day <- 1/(sigma.day*sigma.day)
tau.btl <- 1/(sigma.btl*sigma.btl)
tau.rme <- 1/(sigma.rme*sigma.rme)

for(i in 1:6)
{
mu.day[i]~dnorm(mu,tau.day)
}

for(i in 1:12)
{
mu.btl[i]~dnorm(mu.day[day[i]],tau.btl)
}

for(i in 1:n)
{
y[i]~dnorm(mu.btl[btl[i]],tau.rme)
pred[i]~dnorm(mu.btl[btl[i]],tau.rme)
res[i] <- y[i]-pred[i]
}

mu.nu~dnorm(mu,tau.btl)

}
```

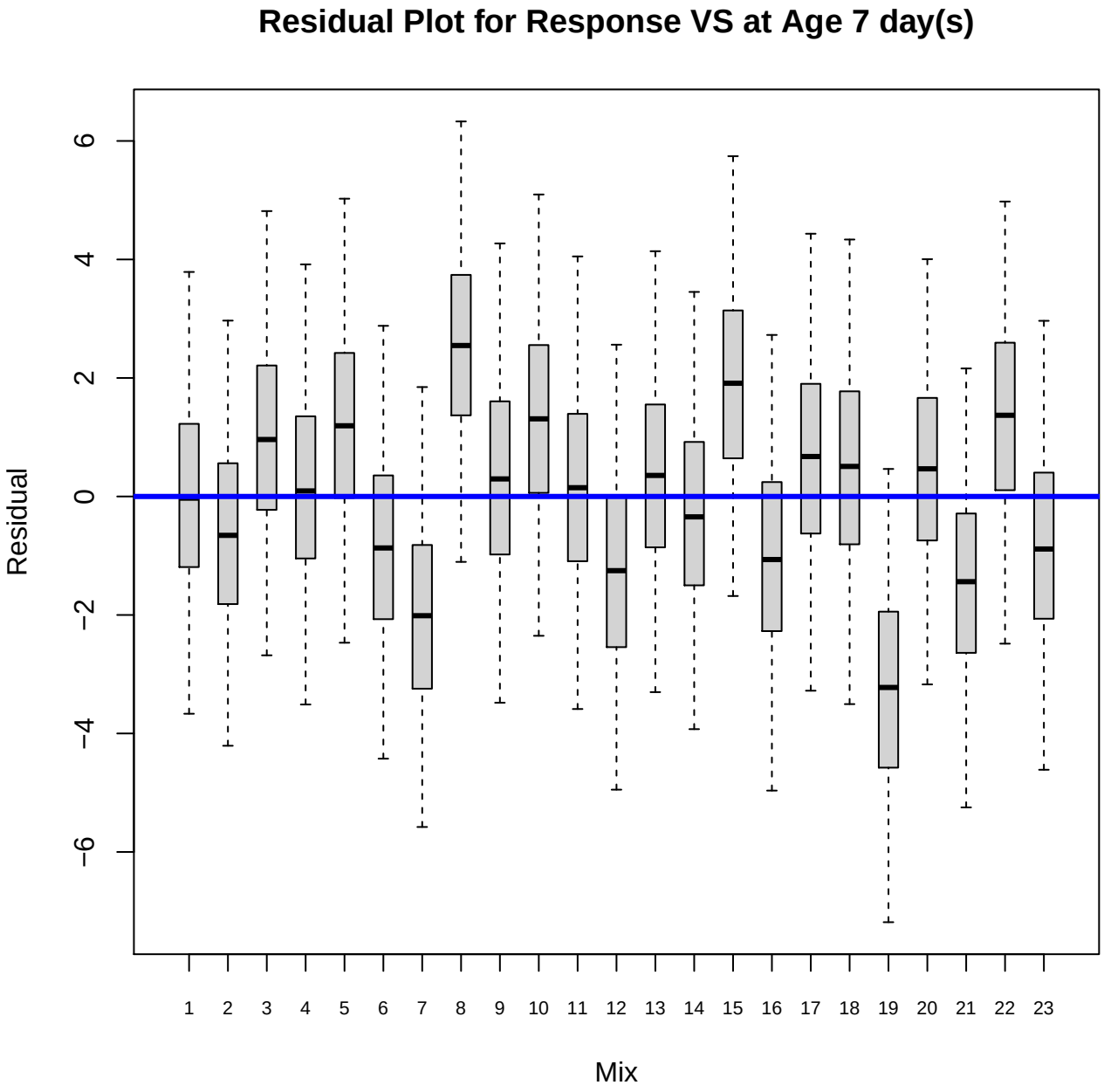

Residual Plot for Response YS at Age 1 day(s)
Residual
15
10
5
0
−5
−10
−15
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Mix

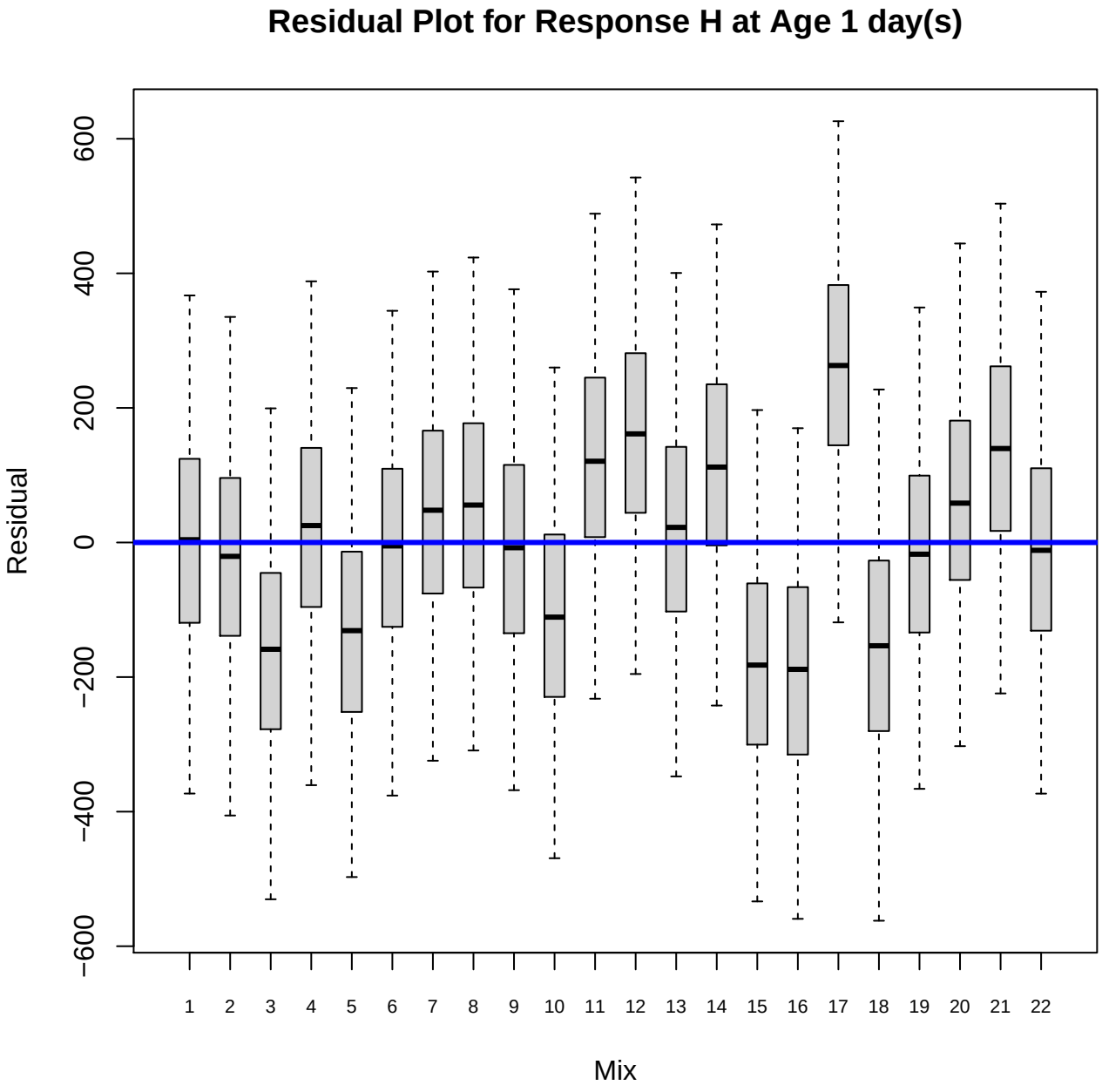

Residual Plot for Response YS at Age 3 day(s)
Residual
10
5
0
−5
−10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Mix

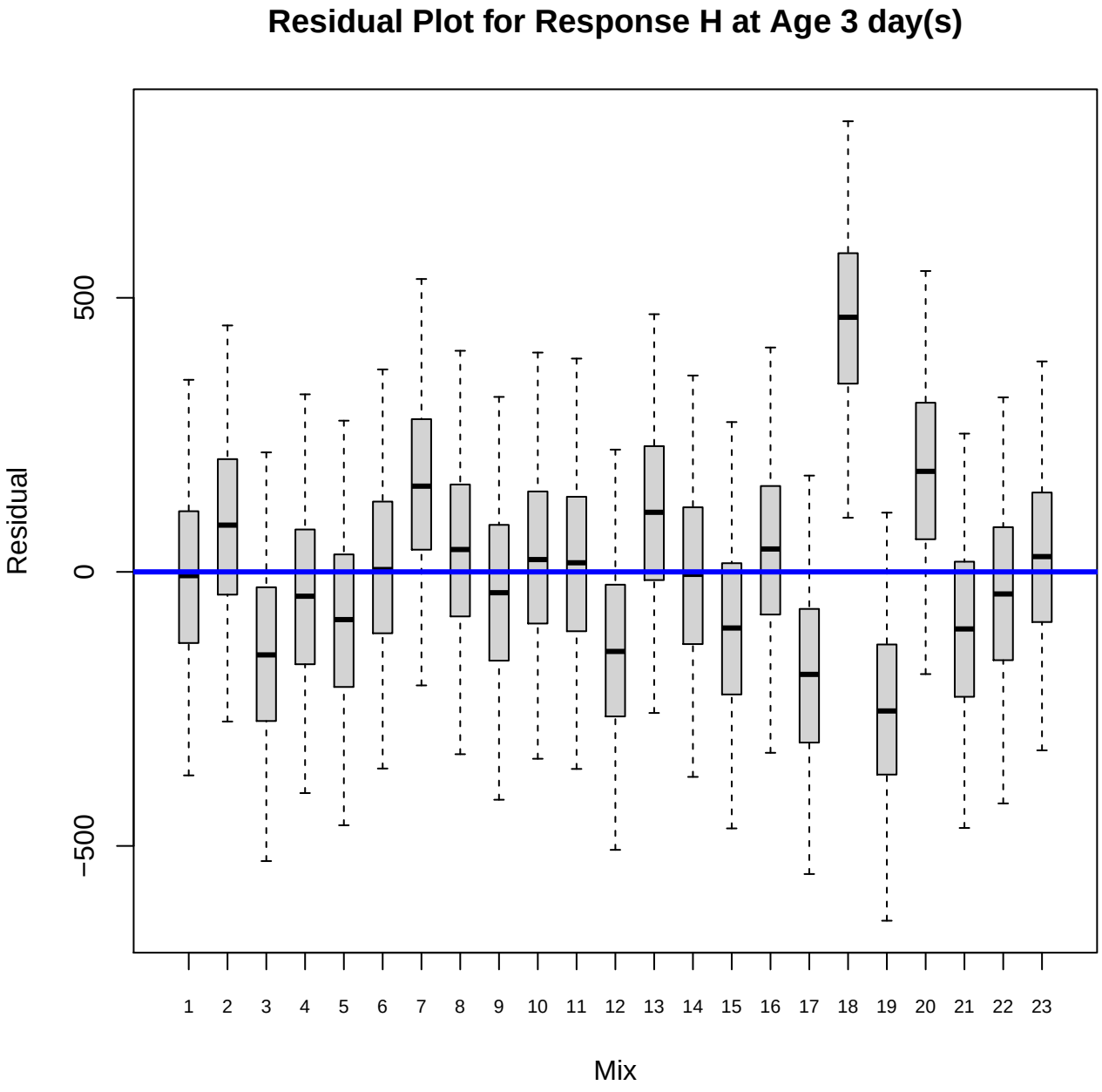

Residual Plot for Response YS at Age 7 day(s)
Residual
10
5
0
−5
−10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Mix

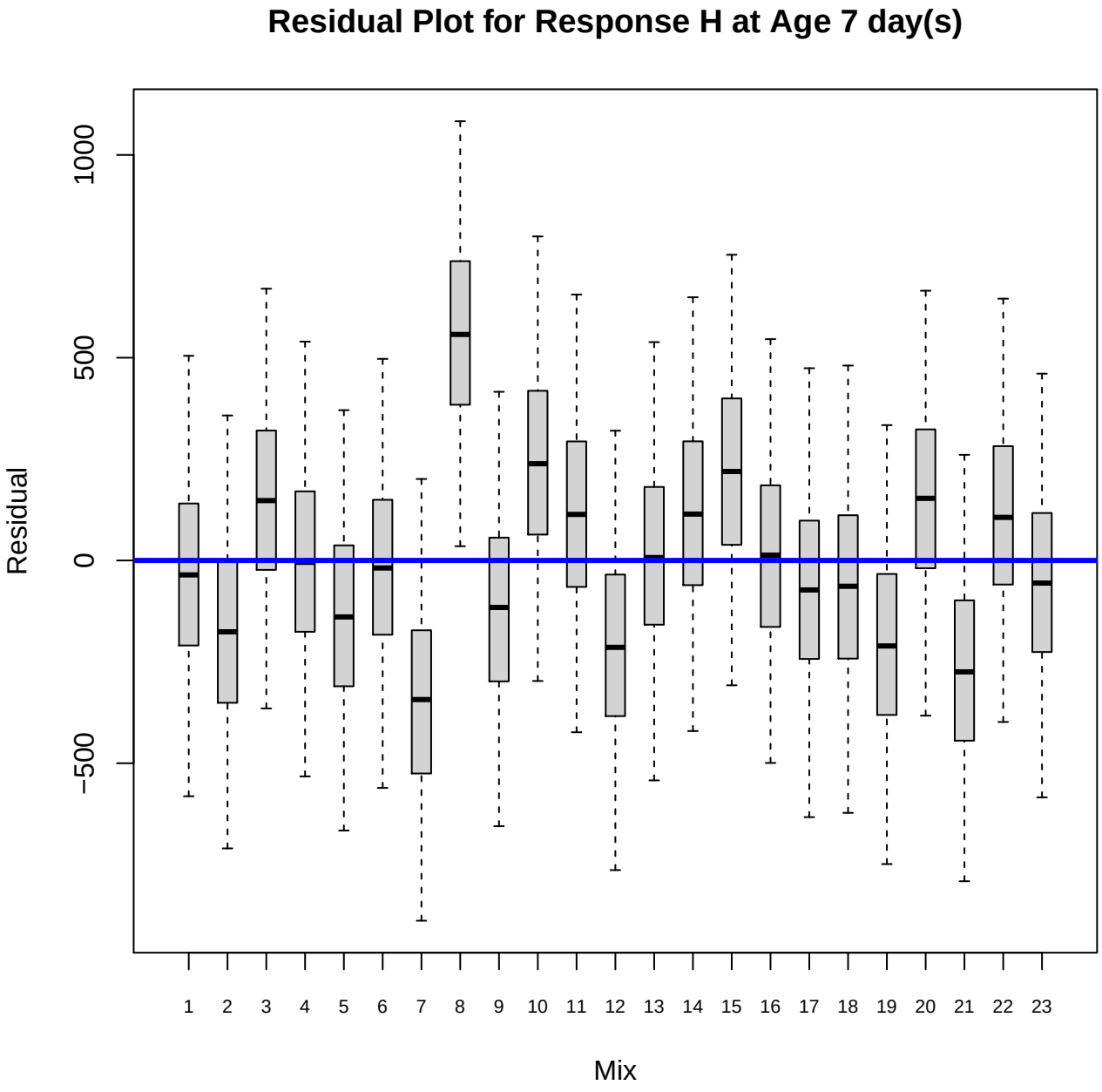

Residual Plot for Response VS at Age 1 day(s)
Residual
4
2
0
−2
−4
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Mix

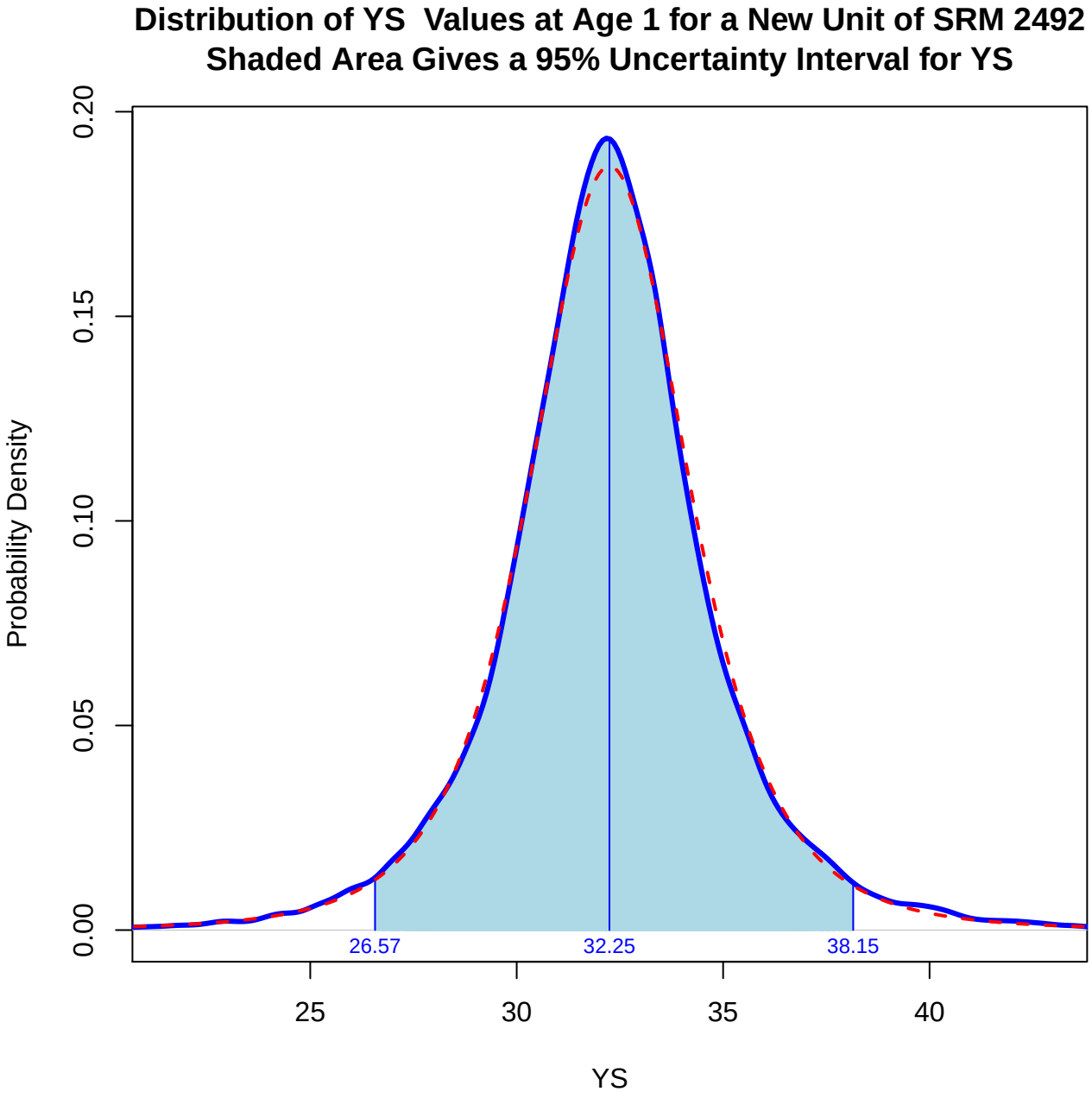

Residual Plot for Response VS at Age 3 day(s)
Residual
4
2
0
−2
−4
−6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Mix

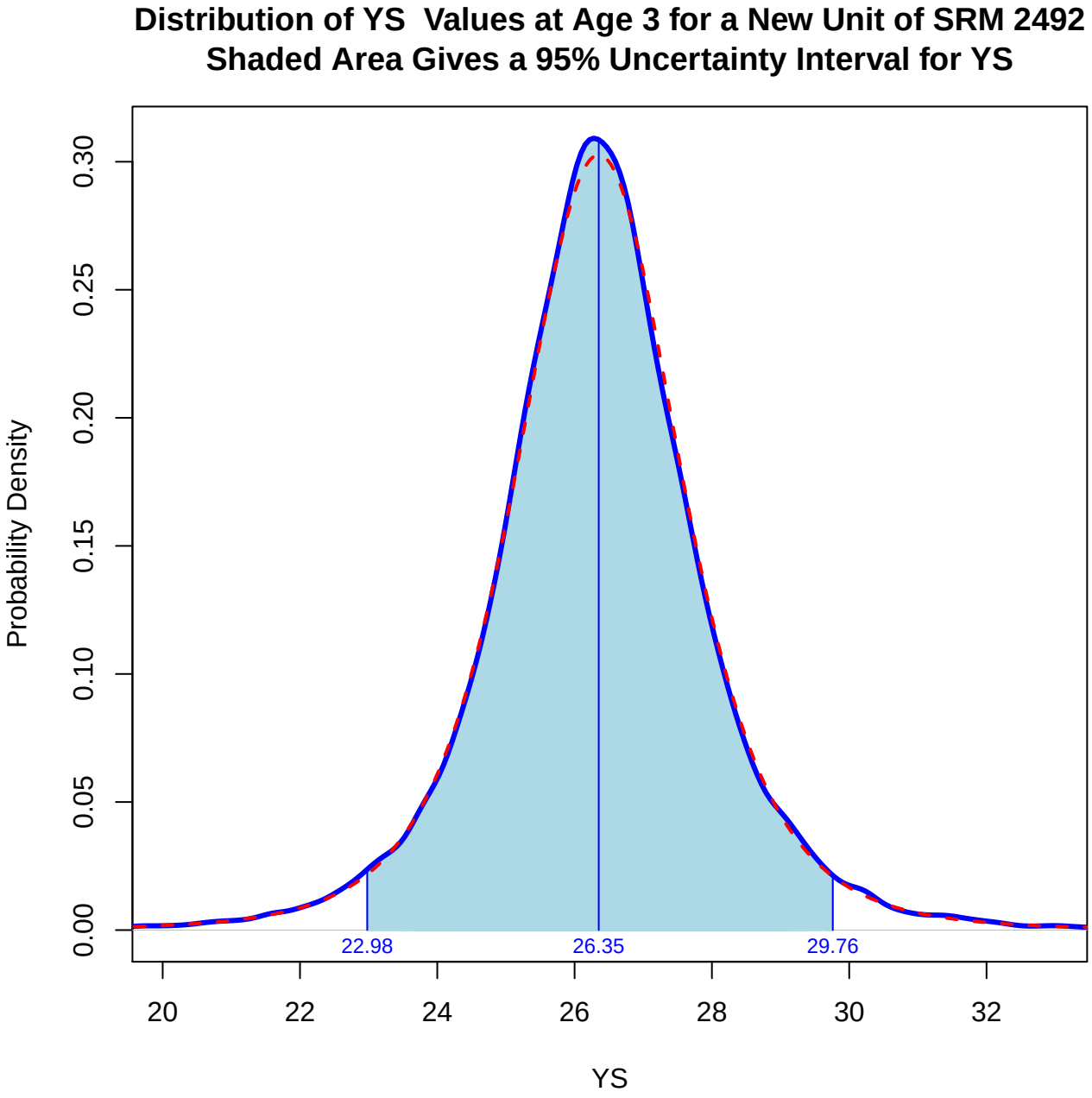

Residual Plot for Response VS at Age 7 day(s)
Residual
6
4
2
0
−2
−4
−6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Mix

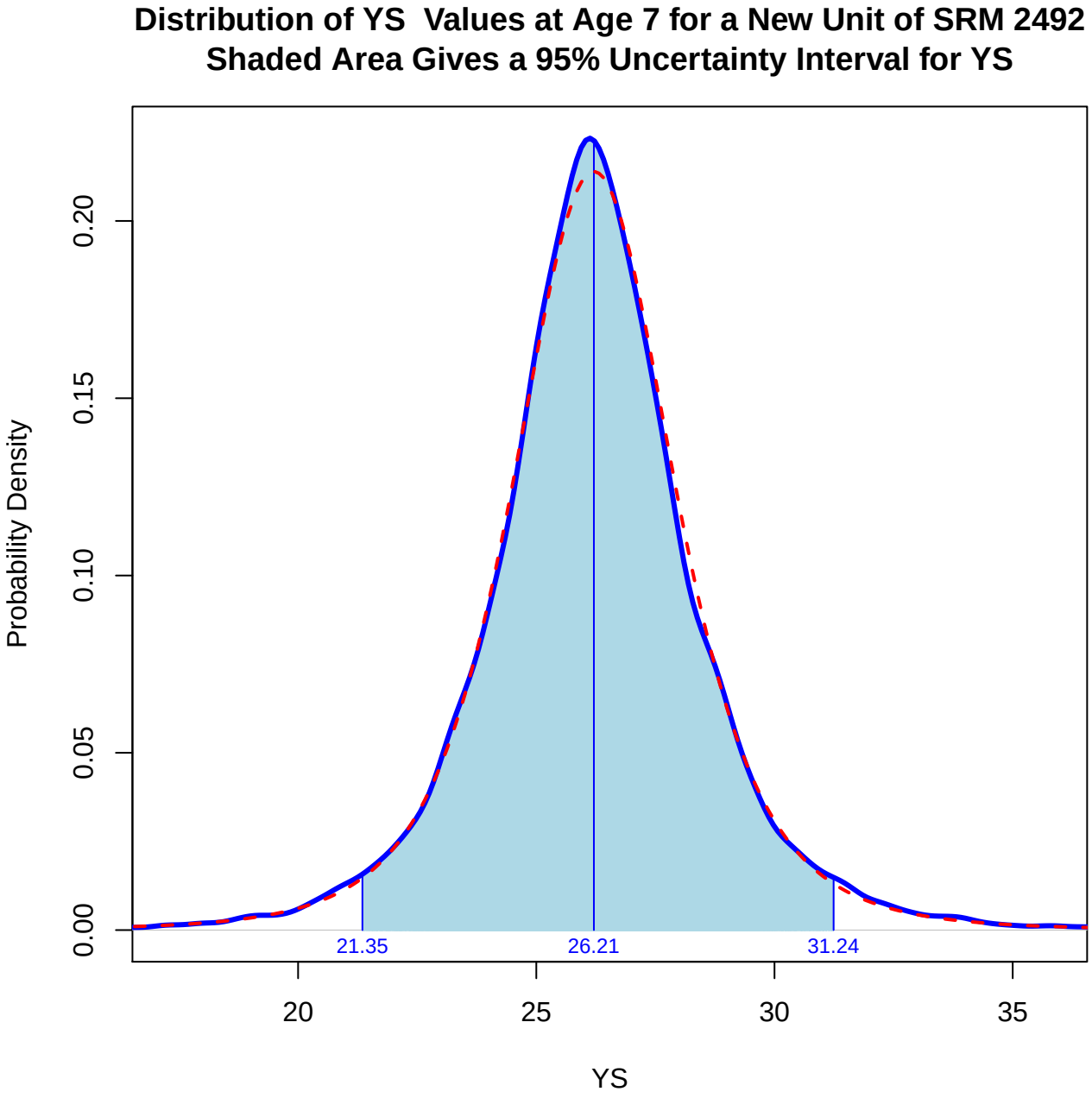

Residual Plot for Response H at Age 1 day(s)
Residual
600
400
200
0
−200
−400
−600
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Mix

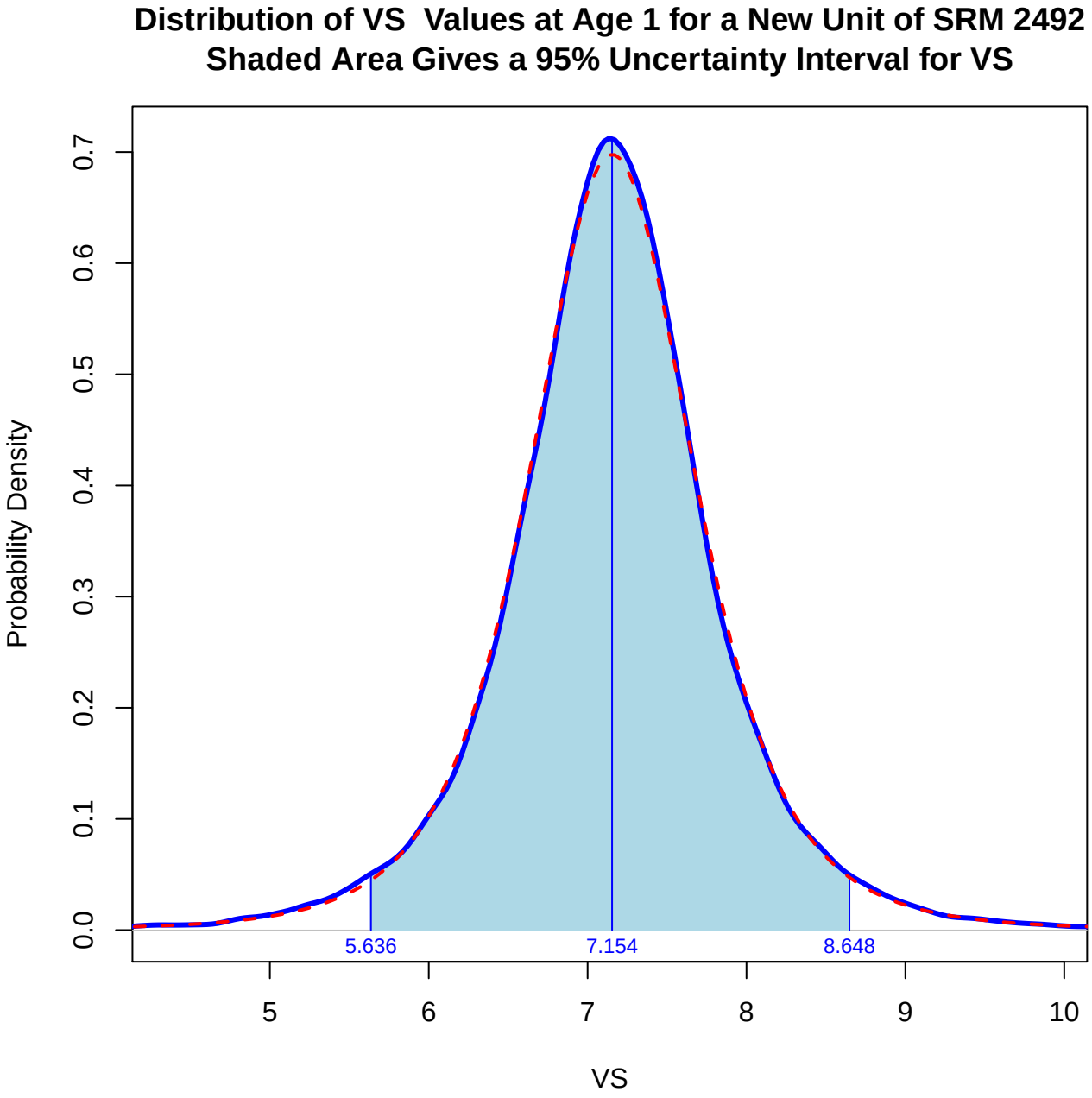

Residual Plot for Response H at Age 3 day(s)
Residual
500
0
−500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Mix

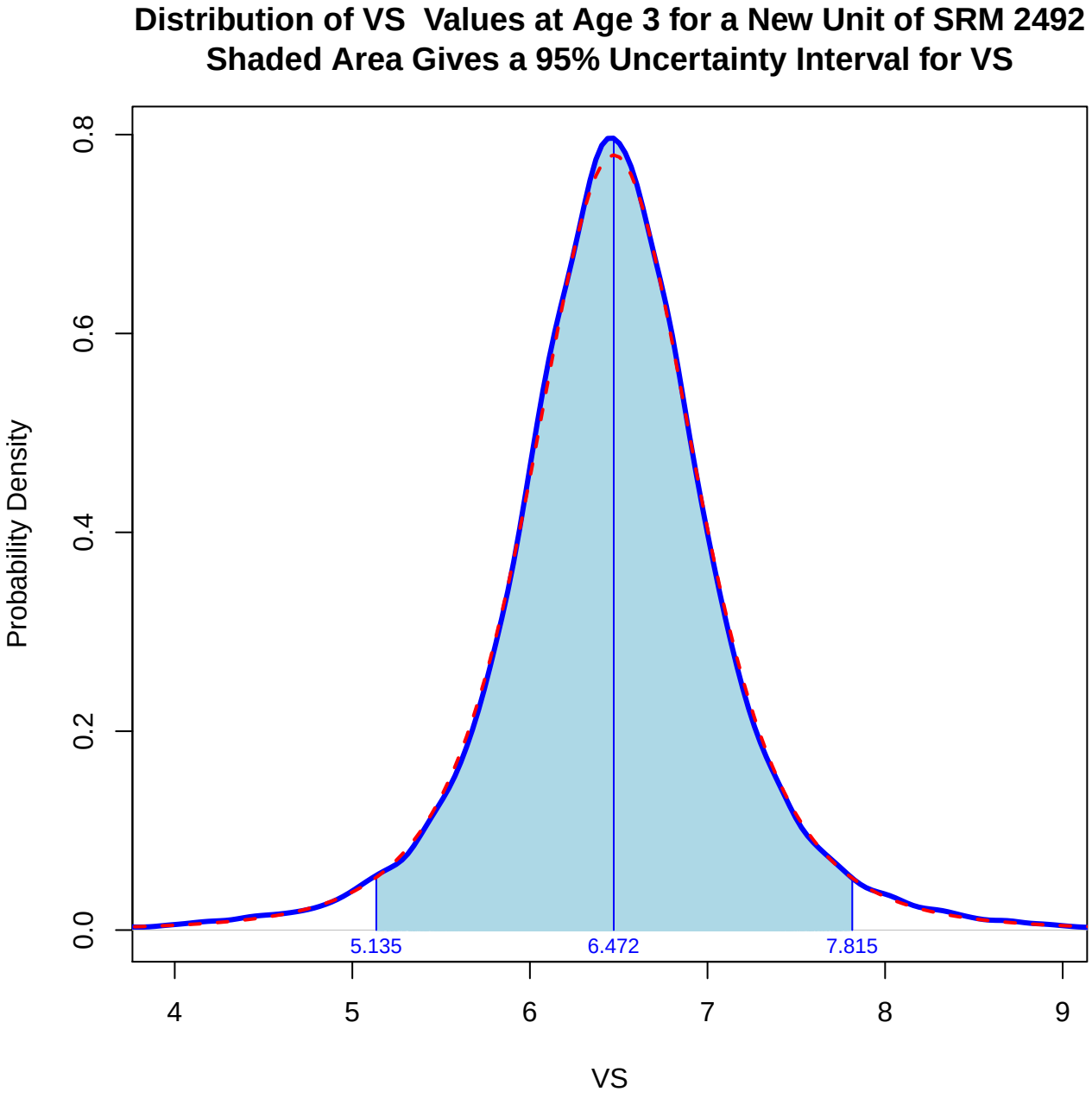

Residual Plot for Response H at Age 7 day(s)
Residual
1000
500
0
−500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Mix

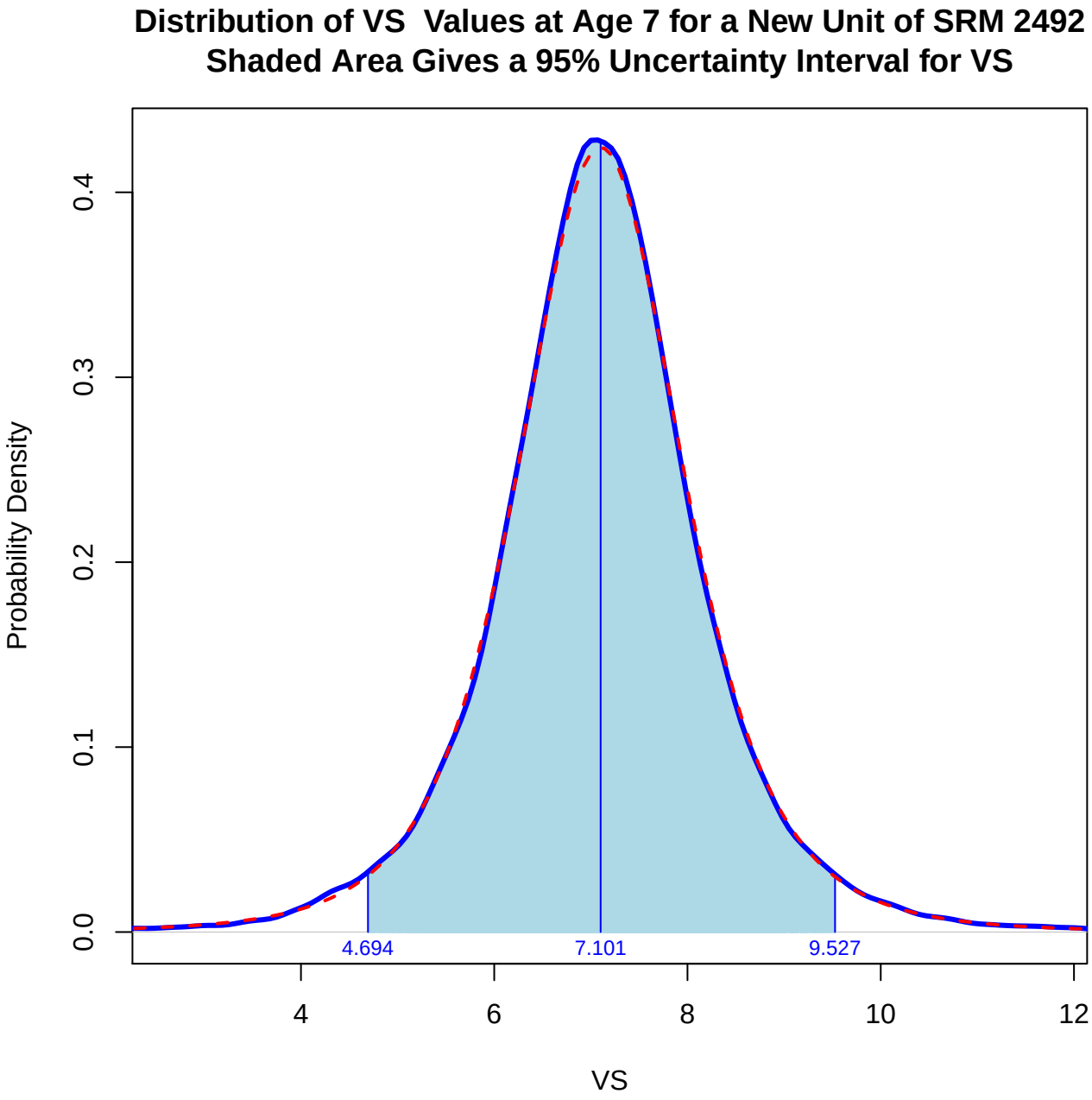

Distribution of YS Values at Age 1 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for YS
Probability Density
0.00
0.05
0.10
0.15
0.20
26.57
32.25
38.15
25
30
35
40
YS

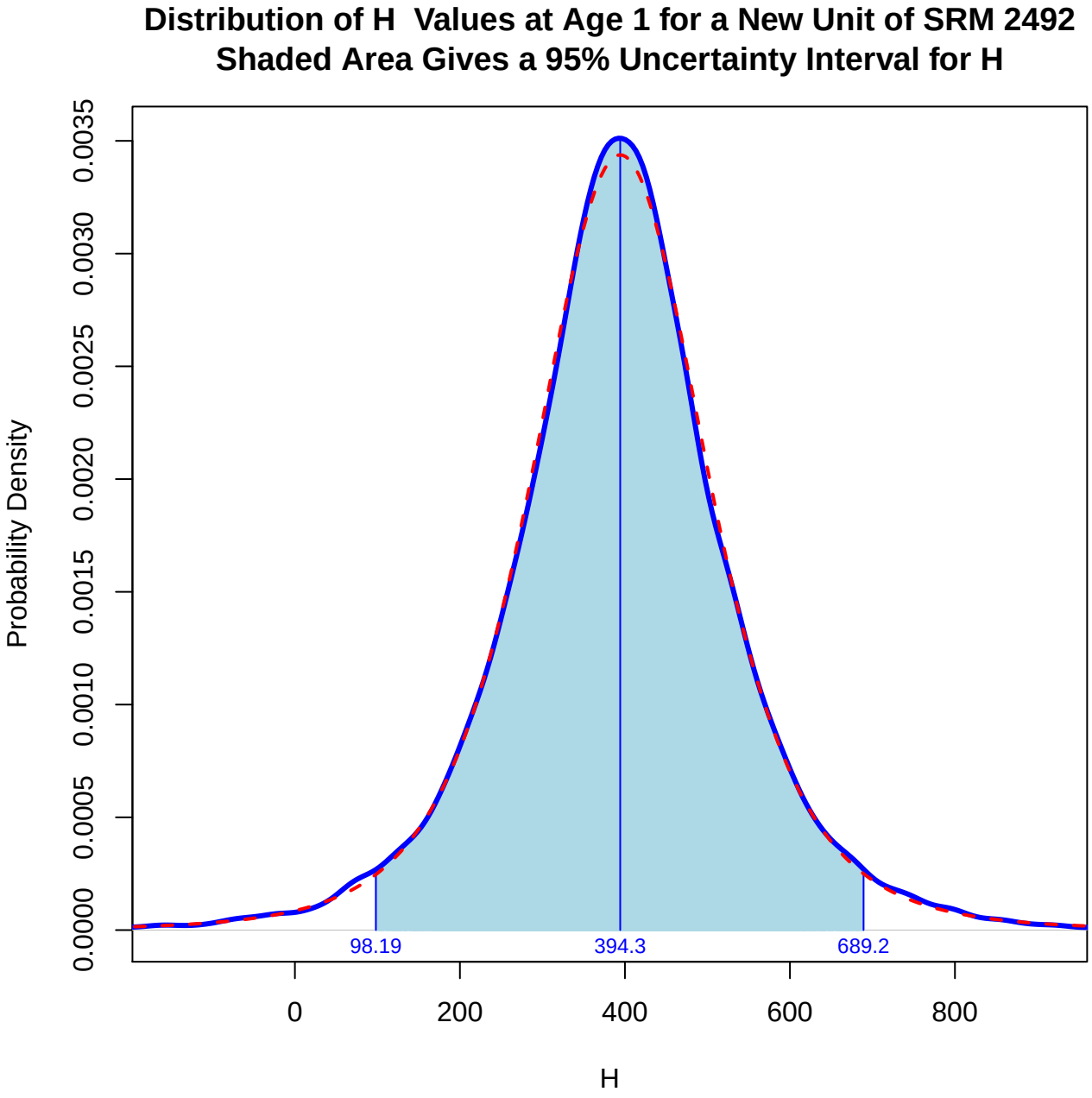

Distribution of YS Values at Age 3 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for YS
Probability Density
0.00
0.05
0.10
0.15
0.20
0.25
0.30
22.98
26.35
29.76
20
22
24
26
28
30
32
YS

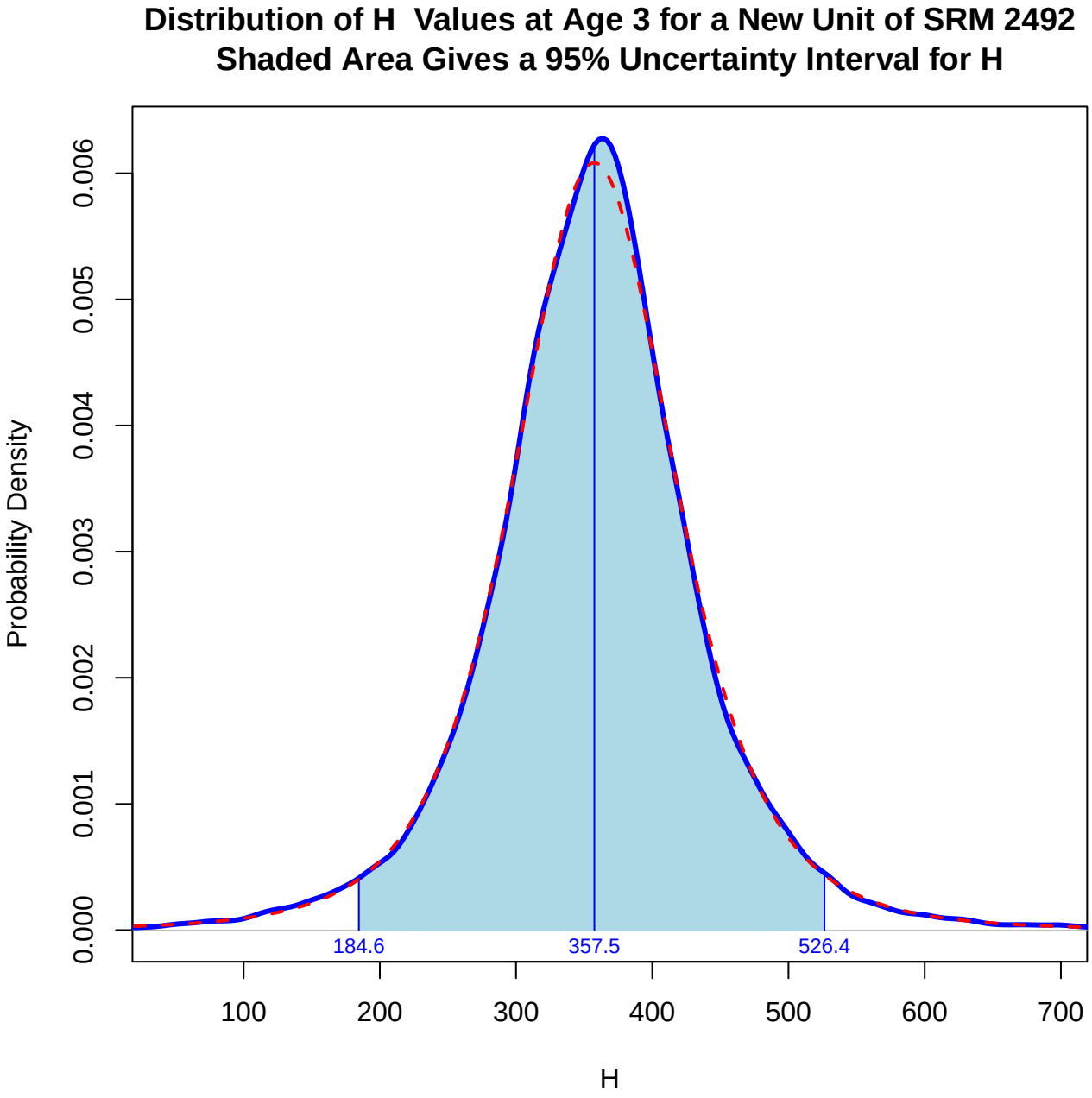

Distribution of YS Values at Age 7 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for YS
Probability Density
0.00
0.05
0.10
0.15
0.20
21.35
26.21
31.24
20
25
30
35
YS

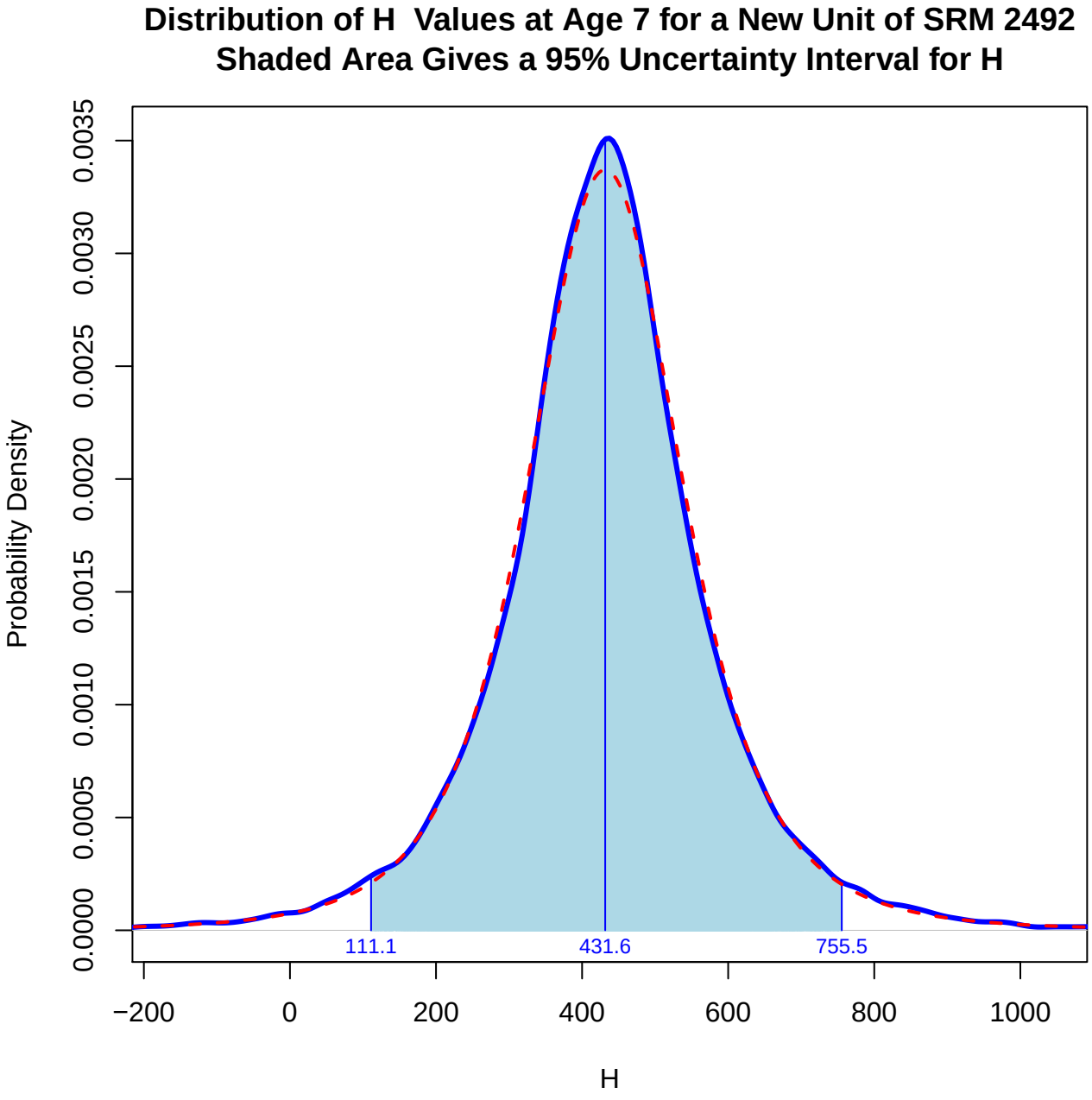

Distribution of VS Values at Age 1 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for VS
Probability Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
5.636
7.154
8.648
5
6
7
8
9
10
VS


Distribution of VS Values at Age 3 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for VS
Probability Density
0.0
0.2
0.4
0.6
0.8
5.135
6.472
7.815
4
5
6
7
8
9
VS


Distribution of VS Values at Age 7 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for VS
Probability Density
0.0
0.1
0.2
0.3
0.4
4.694
7.101
9.527
4
6
8
10
12
VS


Distribution of H Values at Age 1 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for H
Probability Density
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
98.19
394.3
689.2
0
200
400
600
800
H


Distribution of H Values at Age 3 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for H
Probability Density
0.000
0.001
0.002
0.003
0.004
0.005
0.006
184.6
357.5
526.4
100
200
300
400
500
600
700
H


Distribution of H Values at Age 7 for a New Unit of SRM 2492
Shaded Area Gives a 95% Uncertainty Interval for H
Probability Density
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
111.1
431.6
755.5
−200
0
200
400
600
800
1000
H

Appendix B: Raw Data

Legend of the tables

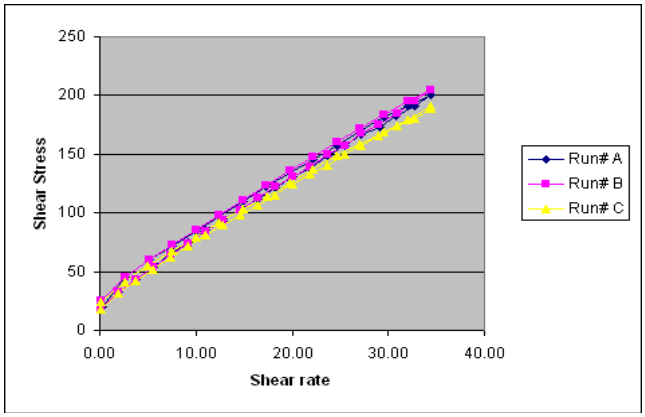
YS = yield stress
VS = plastic viscosity

SR = Shear Rate
SS = Shear Stress

R2 = r^2 calculated using a Pearson function to determine the linearity of the data

Set A1: CS-BX5 – BL45- L2 – Mixing Day – NIST code (folder SR 37-SR-36A)

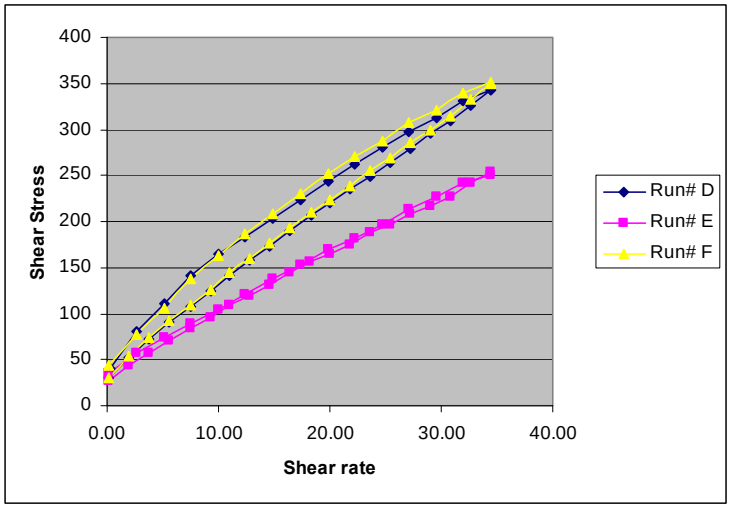
SR-36A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	20.07	0.21	25.76	0.21	23.76	0.23	23.20
2.65	45.03	2.65	45.59	2.65	41.52	2.65	44.05
5.09	59.78	5.09	59.96	5.08	54.45	5.09	58.06
7.52	71.88	7.52	72.81	7.59	67.29	7.54	70.66
10.00	84.16	10.00	85.54	10.00	79.47	10.00	83.06
12.41	96.6	12.41	98.46	12.41	91.32	12.41	95.46
14.90	109.2	14.90	111	14.90	102.9	14.90	107.70
17.31	122.3	17.31	123.9	17.38	114.4	17.33	120.20
19.79	134.4	19.79	136	19.79	125.9	19.79	132.10
22.21	145.9	22.21	148.2	22.21	137.6	22.21	143.90
24.69	157.6	24.69	160.1	24.69	148.6	24.69	155.43
27.10	169.8	27.10	172	27.10	158.4	27.10	166.73
29.59	181	29.59	183.5	29.59	169.3	29.59	177.93
32.00	191.4	32.07	194.7	32.00	179.3	32.02	188.47
34.48	200.7	34.48	204.3	34.48	190.5	34.48	198.50
34.48	200.4	34.48	204.3	34.48	188.8	34.48	197.83
32.69	191	32.69	194.9	32.69	180.5	32.69	188.80
30.83	182.4	30.90	184.7	30.90	173.7	30.87	180.27
29.10	172.9	29.03	175.5	29.03	165.3	29.06	171.23
27.24	166.4	27.24	167.4	27.24	157.2	27.24	163.67
25.45	157.1	25.45	157.6	25.45	149.3	25.45	154.67
23.66	149	23.66	149.3	23.66	140.7	23.66	146.33
21.86	138.5	21.86	139.6	21.86	132.6	21.86	136.90
20.07	130.4	20.07	130.5	20.07	124.4	20.07	128.43
18.21	121	18.21	122.2	18.21	115	18.21	119.40
16.41	112.1	16.41	112.9	16.41	106.5	16.41	110.50
14.62	103	14.62	102.8	14.62	98.58	14.62	101.46
12.83	93.07	12.83	93.5	12.83	89.49	12.83	92.02
11.03	85.19	11.03	84.06	11.03	80.81	11.03	83.35
9.24	74.37	9.24	74.13	9.24	71.52	9.24	73.34
7.45	65.2	7.45	64.17	7.45	62.17	7.45	63.85
5.61	54.09	5.61	54.32	5.62	51.84	5.61	53.42
3.80	43.57	3.81	43.61	3.81	41.76	3.80	42.98
2.00	32.8	2.01	32.37	2.01	31.13	2.01	32.10
0.21	19.49	0.19	19.01	0.21	18.3	0.20	18.93
						Average	Stdev
YS	25.1		24.0		24.4	24.5	0.6
VS	5.2		5.3		4.9	5.1	0.2
R2	1.00		1.00		1.00	1.0	0.0
Hysteresis	163		219		58	147	81



Set A1: CS-BX5 – BL12- L2 – Mixing Day – NIST code (folder SR 37-SR-36B)

SR-36B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	40.11	0.20	34.89	0.19	43.47	0.20	39.49
2.66	80.21	2.65	56.8	2.64	78.06	2.65	71.69
5.09	110.3	5.10	73.48	5.09	105.7	5.09	96.49
7.52	140.7	7.52	89.41	7.52	137.6	7.52	122.57
10.00	164.4	10.00	104.9	10.00	162.5	10.00	143.93
12.41	183.4	12.41	120.7	12.41	186.1	12.41	163.40
14.90	204	14.90	137.9	14.90	209.2	14.90	183.70
17.31	223.4	17.31	153	17.31	230.1	17.31	202.17
19.79	244	19.79	169.2	19.79	251.6	19.79	221.60
22.21	262.2	22.21	181.8	22.21	270	22.21	238.00
24.69	280	24.69	196.4	24.69	288	24.69	254.80
27.10	298	27.10	213.9	27.10	306.9	27.10	272.93
29.59	312.7	29.59	226.1	29.59	321.4	29.59	286.73
32.00	330.3	32.00	241.4	32.00	338.9	32.00	303.53
34.48	342.8	34.48	250.2	34.48	350.6	34.48	314.53
34.48	342.4	34.48	253.1	34.48	350.2	34.48	315.23
32.69	326.8	32.69	242.1	32.69	333.3	32.69	300.73
30.83	309.2	30.83	227.2	30.90	314.5	30.85	283.63
29.03	295	29.03	216.7	29.03	298.9	29.03	270.20
27.24	279.2	27.24	209.1	27.24	285.5	27.24	257.93
25.45	264.4	25.45	196.2	25.45	269	25.45	243.20
23.66	249.5	23.66	188.1	23.66	255.5	23.66	231.03
21.86	234.9	21.86	174.6	21.86	238.5	21.86	216.00
20.00	219.4	20.07	164.4	20.07	223.5	20.05	202.43
18.28	206	18.21	155.6	18.28	209.3	18.25	190.30
16.41	190.3	16.41	144.4	16.41	193.6	16.41	176.10
14.62	173.1	14.62	131	14.62	176.5	14.62	160.20
12.83	157.9	12.83	119.3	12.83	160.1	12.83	145.77
11.03	140.9	11.03	108.8	11.03	144.6	11.03	131.43
9.24	124.8	9.24	95.39	9.24	126.7	9.24	115.63
7.45	107.5	7.45	83.77	7.45	109.9	7.45	100.39
5.61	90.54	5.61	70.53	5.61	92.03	5.61	84.37
3.81	72.07	3.81	56.87	3.81	73.12	3.81	67.35
1.99	52.08	2.00	43.06	2.00	53.28	2.00	49.47
0.19	30.37	0.20	26.53	0.20	30.9	0.20	29.27

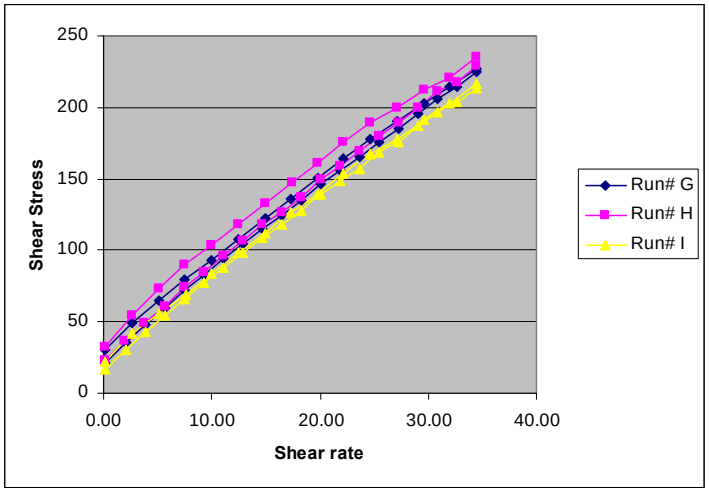
				Average	Stdev
YS	39.6	34.2	40.3	38.0	3.3
VS	8.9	6.4	9.0	8.1	1.5
R2	1.00	1.00	1.00	1.0	0.0
Hysteresis	753	269	777	600	287



Set A1: CS-BX5 – BL12- L1 – Mixing Day – NIST code (folder SR 37-SR-36C)

SR-36C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	30.05	0.20	31.97	0.19	22.11	0.20	28.04
2.64	48.71	2.65	54.09	2.66	41.36	2.65	48.05
5.10	64.62	5.09	73.06	5.09	55.64	5.09	64.44
7.52	79.09	7.52	89.66	7.59	69.47	7.54	79.41
10.00	93.23	10.00	104	10.00	83.92	10.00	93.72
12.41	107.8	12.41	118.4	12.41	98.07	12.41	108.09
14.90	122.5	14.90	132.8	14.90	111.8	14.90	122.37
17.31	136.5	17.38	147.7	17.31	126.2	17.33	136.80
19.79	150.7	19.79	161.2	19.79	139.5	19.79	150.47
22.21	164.7	22.21	176.1	22.21	153.9	22.21	164.90
24.69	178.2	24.69	189.3	24.69	166.9	24.69	178.13
27.17	190.3	27.10	199.6	27.10	177.9	27.13	189.27
29.59	203.1	29.59	212.1	29.59	191.5	29.59	202.23
32.00	214.6	32.00	221.2	32.00	202.7	32.00	212.83
34.48	227.2	34.48	234.9	34.48	216.7	34.48	226.27
34.48	224.5	34.48	229	34.48	213.9	34.48	222.47
32.69	214.1	32.69	218	32.69	204.3	32.69	212.13
30.83	205.8	30.90	210.8	30.90	196.7	30.87	204.43
29.03	195.8	29.03	199.6	29.03	187.3	29.03	194.23
27.24	185.4	27.24	189.4	27.24	176.2	27.24	183.67
25.45	176.1	25.45	180.2	25.45	168	25.45	174.77
23.66	165.7	23.66	169.1	23.66	157.1	23.66	163.97
21.86	155.7	21.86	159.2	21.86	148.7	21.86	154.53
20.07	146.4	20.07	149.5	20.07	138.6	20.07	144.83
18.21	135.2	18.21	136.8	18.21	127.7	18.21	133.23
16.41	125	16.41	126.4	16.41	117.8	16.41	123.07
14.62	115.4	14.62	118.1	14.62	108.6	14.62	114.03
12.83	104.2	12.83	106.5	12.83	98.11	12.83	102.94
11.03	94.4	11.03	96.48	11.03	87.4	11.03	92.76
9.24	82.73	9.24	84.77	9.24	77.07	9.24	81.52
7.45	72.06	7.45	74.02	7.45	65.93	7.45	70.67
5.61	59.7	5.61	60.99	5.61	54.48	5.61	58.39
3.82	47.75	3.80	49.04	3.81	42.95	3.81	46.58
2.01	35.23	2.01	36.62	2.02	30.59	2.01	34.15
0.20	21.11	0.19	22.53	0.20	16.71	0.20	20.12

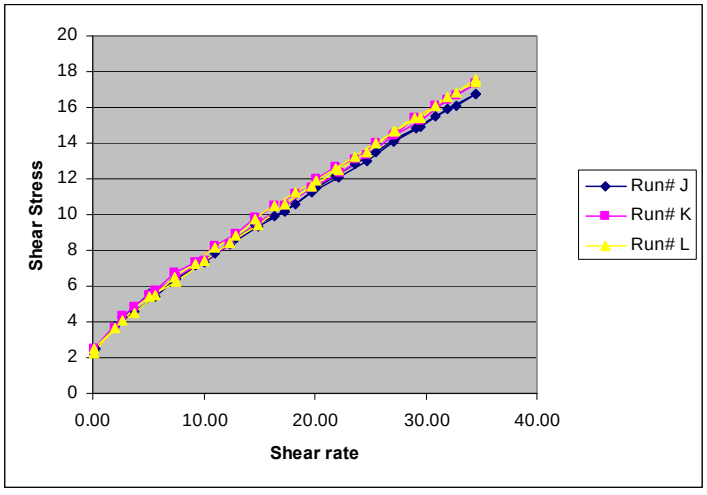
				Average	Stdev
YS	26.9	27.9	22.6	25.8	2.9
VS	5.8	5.9	5.7	5.8	0.1
R2	1.00	1.00	1.00	1.0	0.0
Hysteresis	115	230	6	117	112



Set A1: CS-BX5 – BL45- L1 – Mixing Day – NIST code (folder SR 37-SR-36D)

SR-36D							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	2.532	0.19	2.485	0.20	2.495	0.20	2.50
2.66	4.245	2.63	4.349	2.64	4.068	2.64	4.22
5.10	5.545	5.10	5.492	5.08	5.429	5.09	5.49
7.52	6.39	7.52	6.471	7.52	6.239	7.52	6.37
10.00	7.345	10.00	7.419	10.00	7.389	10.00	7.38
12.41	8.319	12.41	8.355	12.41	8.404	12.41	8.36
14.90	9.352	14.90	9.551	14.90	9.414	14.90	9.44
17.31	10.15	17.31	10.52	17.38	10.58	17.33	10.42
19.79	11.29	19.79	11.51	19.79	11.58	19.79	11.46
22.21	12.11	22.28	12.35	22.21	12.52	22.23	12.33
24.69	13.01	24.69	13.35	24.69	13.51	24.69	13.29
27.10	14.09	27.17	14.44	27.10	14.63	27.13	14.39
29.59	14.88	29.59	15.25	29.59	15.44	29.59	15.19
32.00	15.93	32.00	16.4	32.00	16.61	32.00	16.31
34.48	16.76	34.48	17.35	34.48	17.42	34.48	17.18
34.48	16.77	34.48	17.37	34.48	17.56	34.48	17.23
32.69	16.08	32.69	16.7	32.69	16.87	32.69	16.55
30.90	15.5	30.83	16.06	30.90	16.12	30.87	15.89
29.10	14.81	29.03	15.42	29.03	15.38	29.06	15.20
27.24	14.26	27.24	14.48	27.24	14.7	27.24	14.48
25.45	13.48	25.45	13.99	25.45	14.01	25.45	13.83
23.66	12.86	23.66	13.09	23.66	13.28	23.66	13.08
21.86	12.16	21.86	12.65	21.86	12.59	21.86	12.47
20.07	11.46	20.07	12	20.07	11.9	20.07	11.79
18.28	10.6	18.28	11.2	18.21	11.22	18.25	11.01
16.41	9.889	16.41	10.47	16.41	10.54	16.41	10.30
14.62	9.399	14.62	9.842	14.62	9.725	14.62	9.66
12.83	8.627	12.83	8.921	12.83	8.806	12.83	8.78
11.03	7.837	11.03	8.232	11.03	8.206	11.03	8.09
9.24	7.144	9.24	7.369	9.24	7.265	9.24	7.26
7.45	6.311	7.45	6.717	7.45	6.533	7.45	6.52
5.61	5.396	5.61	5.752	5.62	5.528	5.61	5.56
3.81	4.606	3.81	4.821	3.80	4.509	3.81	4.65
2.01	3.746	2.01	3.668	2.01	3.688	2.01	3.70
0.20	2.316	0.20	2.311	0.20	2.268	0.20	2.30

					Average	Stdev
YS	3.1		3.3		3.1	3.2	0.1
VS	0.4		0.4		0.4	0.4	0.0
R2	1.00		0.99		1.00	1.0	0.0
Hysteresis	1		6		0	2	3

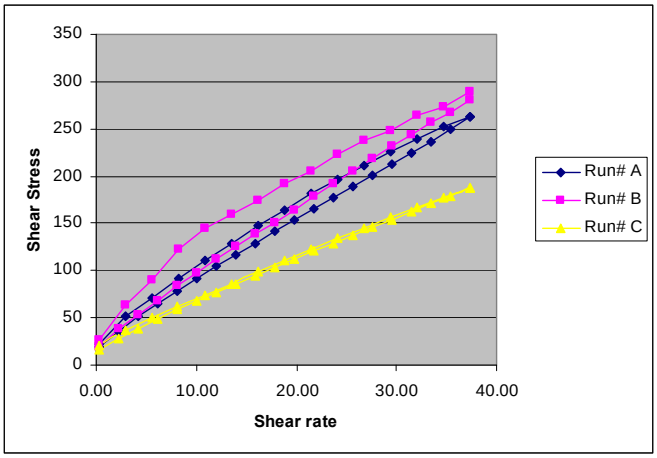


Comment: Problem with mixer = material not mixed properly - a lot of sedimentation

Set A3: CS-BX5 – BL45- L2 – 3 day – NIST code (folder SR 38-SR-36A)

SR-36A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.22	22.31	0.22	27.19	0.22	20.25	0.22	23.25
2.86	51.26	2.86	63.29	2.86	36.73	2.86	50.43
5.53	70.43	5.51	90.65	5.53	50.01	5.52	70.36
8.22	91.68	8.22	123.3	8.15	62.63	8.20	92.54
10.84	111	10.84	144.2	10.84	74.39	10.84	109.86
13.46	128.6	13.46	159.9	13.46	86.27	13.46	124.92
16.15	147.5	16.15	174.9	16.15	98.42	16.15	140.27
18.77	164.1	18.77	191.5	18.77	110.4	18.77	155.33
21.46	181.1	21.46	205.9	21.46	122.2	21.46	169.73
24.07	195.8	24.07	223.1	24.07	133.8	24.07	184.23
26.77	210.9	26.77	237.8	26.77	145	26.77	197.90
29.38	226	29.38	248.8	29.46	156.5	29.41	210.43
32.07	239.2	32.07	264.2	32.07	166.9	32.07	223.43
34.69	252	34.69	273.6	34.69	177.6	34.69	234.40
37.38	263.6	37.38	289.4	37.38	188.1	37.38	247.03
37.38	262.3	37.38	281.3	37.38	187.4	37.38	243.67
35.44	249.7	35.44	267	35.44	178.7	35.44	231.80
33.50	236.5	33.50	256.9	33.42	170.8	33.47	221.40
31.48	224.8	31.48	243	31.48	162.4	31.48	210.07
29.53	213.2	29.53	231.2	29.53	153.7	29.53	199.37
27.59	201	27.59	218	27.59	145.9	27.59	188.30
25.64	189.6	25.64	205.2	25.64	137.1	25.64	177.30
23.70	177.6	23.70	191.5	23.70	128.8	23.70	165.97
21.76	165.4	21.76	179.1	21.76	120.6	21.76	155.03
19.74	154.2	19.74	163.9	19.81	111.7	19.76	143.27
17.79	142	17.79	151.1	17.79	103.1	17.79	132.07
15.85	129.2	15.85	139.4	15.85	94.54	15.85	121.05
13.91	117.3	13.91	125.3	13.91	85.72	13.91	109.44
11.96	104.3	11.96	112.8	11.96	77.03	11.96	98.04
10.02	91.56	10.02	98.08	10.02	67.71	10.02	85.78
8.07	78.25	8.07	84.2	8.07	58.39	8.07	73.61
6.09	64.93	6.08	68.47	6.08	48.83	6.08	60.74
4.12	50.96	4.13	53.4	4.14	39.01	4.13	47.79
2.18	35.94	2.19	37.92	2.18	28.51	2.19	34.12
0.22	18.84	0.22	19.25	0.21	16.19	0.22	18.09

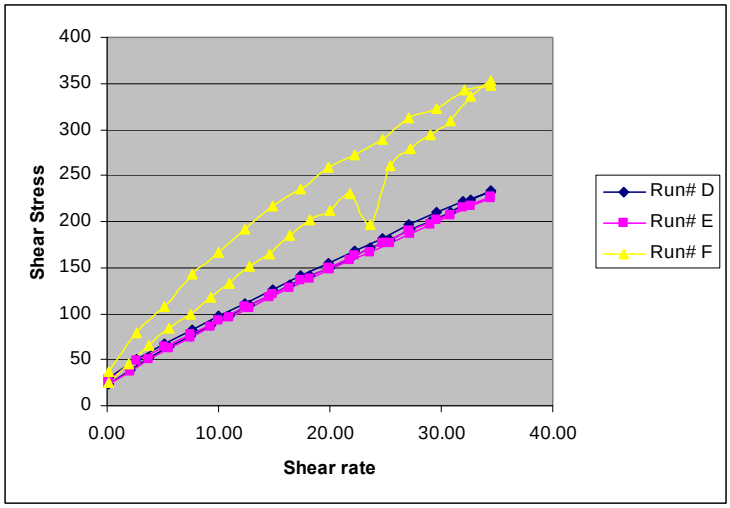
					Average	Stdev
YS	25.3		26.2		21.0	24.2	2.8
VS	6.4		6.9		4.5	5.9	1.3
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	414		670		83	389	294



Set A3: CS-BX5 – BL12- L2 – 3 day – NIST code (folder SR 38-SR-36B)

SR-36B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	30.46	0.20	28.89	0.20	37.25	0.20	32.20
2.66	50.8	2.63	48.38	2.65	79.13	2.65	59.44
5.09	66.68	5.08	63.77	5.08	107.9	5.09	79.45
7.59	82.17	7.52	78.03	7.59	142.1	7.56	100.77
10.00	96.75	10.00	92.33	10.00	167.2	10.00	118.76
12.41	111.1	12.41	107.1	12.41	191.1	12.41	136.43
14.90	125.8	14.90	121.5	14.90	216.2	14.90	154.50
17.31	140.7	17.31	135.5	17.38	235.6	17.33	170.60
19.79	155.3	19.79	149.5	19.79	258.4	19.79	187.73
22.21	168.6	22.21	163.2	22.28	271.6	22.23	201.13
24.69	182.1	24.69	176.4	24.69	288.5	24.69	215.67
27.10	196.7	27.10	189.7	27.10	311.8	27.10	232.73
29.59	209.4	29.59	202.5	29.59	323.3	29.59	245.07
32.00	222.4	32.00	214.7	32.07	343	32.02	260.03
34.48	232.6	34.48	226.2	34.48	348.1	34.48	268.97
34.48	233.5	34.48	225.7	34.48	353.7	34.48	270.97
32.69	222.8	32.69	216	32.69	335.5	32.69	258.10
30.90	210.8	30.90	206.2	30.90	308.8	30.90	241.93
29.03	200.7	29.03	196.6	29.03	293.7	29.03	230.33
27.24	192.2	27.24	186.6	27.24	278.6	27.24	219.13
25.45	180.6	25.45	177.2	25.45	260.2	25.45	206.00
23.66	171.9	23.66	167.2	23.66	197	23.66	178.70
21.86	160.5	21.86	157.8	21.86	230	21.86	182.77
20.07	150.1	20.07	147.7	20.07	212.6	20.07	170.13
18.21	141.3	18.21	137.7	18.21	201.9	18.21	160.30
16.41	130.8	16.41	127.6	16.41	185.5	16.41	147.97
14.62	119	14.62	117.3	14.62	165	14.62	133.77
12.83	108.7	12.83	106.6	12.83	150.7	12.83	122.00
11.03	97.86	11.03	95.85	11.03	132.6	11.03	108.77
9.24	86.61	9.24	85.11	9.24	117.3	9.24	96.34
7.45	75.03	7.45	74.04	7.45	99.27	7.45	82.78
5.61	64.12	5.61	62.48	5.61	84.06	5.61	70.22
3.81	51.58	3.79	50.29	3.79	65.57	3.80	55.81
2.02	38.55	2.02	37.45	2.01	45.87	2.02	40.62
0.20	23.74	0.20	22.92	0.20	24.7	0.20	23.79

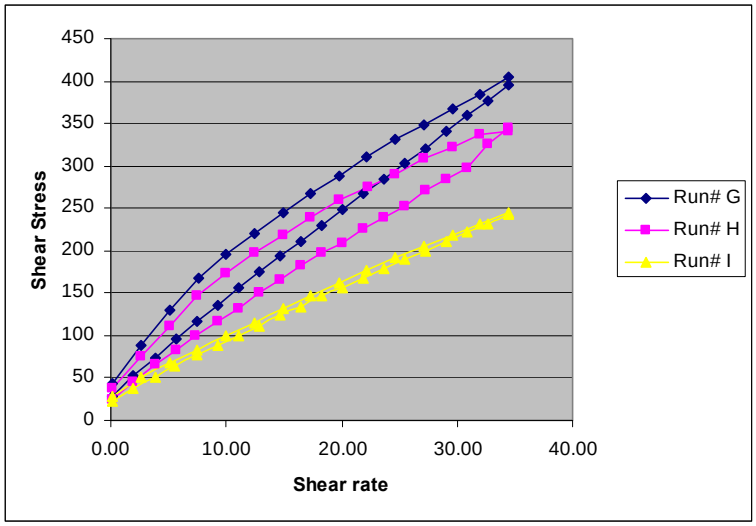
				Average	Stdev
YS	29.7	29.5	29.5	29.6	0.1
VS	6.0	5.8	9.1	6.9	1.9
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	214	100	1439	584	742



Set A3: CS-BX5 – BL12- L1 – 3 day – NIST code (folder SR 38-SR-36C)

SR-36C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	42.83	0.16	37.74	0.20	28.2	0.19	36.26
2.65	88.37	2.65	75.6	2.65	50.25	2.65	71.41
5.09	129.2	5.10	111.9	5.09	67.3	5.09	102.80
7.59	167.8	7.52	146.8	7.52	83.41	7.54	132.67
10.00	196	10.00	173.2	10.00	99.62	10.00	156.27
12.41	221.2	12.41	196.8	12.41	115.5	12.41	177.83
14.90	244.2	14.90	218.8	14.90	131	14.90	198.00
17.31	267	17.31	239.6	17.31	146.8	17.31	217.80
19.79	288.3	19.79	258.9	19.79	161.7	19.79	236.30
22.21	311.5	22.28	274.7	22.21	177.3	22.23	254.50
24.69	331.7	24.69	290.6	24.69	191.8	24.69	271.37
27.10	348.2	27.10	309.3	27.10	204.9	27.10	287.47
29.59	367.7	29.59	322.7	29.59	219.1	29.59	303.17
32.00	383.6	32.00	337.3	32.00	231.8	32.00	317.57
34.48	404.1	34.48	341.1	34.48	245.6	34.48	330.27
34.48	395.8	34.48	344.4	34.48	243.4	34.48	327.87
32.69	375.9	32.69	326.6	32.69	232.2	32.69	311.57
30.90	359.2	30.90	298.2	30.83	221.8	30.87	293.07
29.03	340.5	29.03	285.1	29.10	211.1	29.06	278.90
27.24	319.6	27.24	271.2	27.24	199.5	27.24	263.43
25.45	303.6	25.45	252.7	25.45	189.4	25.45	248.57
23.66	283.8	23.66	239.3	23.66	178	23.66	233.70
21.86	267	21.86	226	21.86	168.1	21.86	220.37
20.07	249.2	20.07	209.1	20.00	156.9	20.05	205.07
18.21	229	18.28	198.3	18.21	146	18.23	191.10
16.41	210.8	16.41	181.9	16.41	134.6	16.41	175.77
14.62	193.9	14.62	164.9	14.62	123.6	14.62	160.80
12.83	174.4	12.83	150.5	12.83	112	12.83	145.63
11.03	156.1	11.03	131	11.03	100.3	11.03	129.13
9.24	136.2	9.24	117.6	9.24	88.46	9.24	114.09
7.45	116.9	7.38	99.27	7.45	76.29	7.43	97.49
5.61	95.71	5.61	83.23	5.59	63.67	5.60	80.87
3.81	74.34	3.81	65.26	3.81	50.66	3.81	63.42
2.01	52.12	2.00	44.91	1.99	36.78	2.00	44.60
0.19	27.41	0.20	24.58	0.20	21.85	0.20	24.61

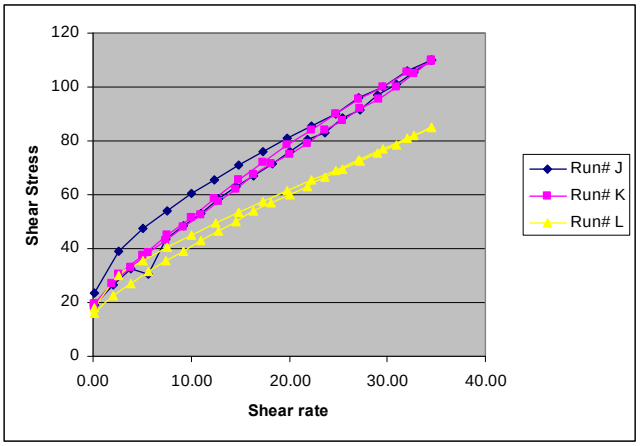
				Average	Stdev
YS	35.7	31.3	27.8	31.6	4.0
VS	10.5	8.9	6.3	8.6	2.1
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	963	1451	134	850	666



Set A3: CS-BX5 – BL45- L1 – 3 day – NIST code (folder SR 38-SR-36D)

SR-36D							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	23.51	0.19	18.73	0.20	17.93	0.20	20.06
2.64	39.11	2.64	30.47	2.63	30.02	2.64	33.20
5.10	47.73	5.10	37.6	5.09	35.54	5.10	40.29
7.52	54.05	7.59	44.81	7.52	40.39	7.54	46.42
10.00	60.33	10.00	51.53	10.00	45.04	10.00	52.30
12.41	65.67	12.41	58.54	12.48	49.41	12.44	57.87
14.90	70.99	14.90	65.72	14.90	53.43	14.90	63.38
17.38	76.12	17.31	72.17	17.31	57.6	17.33	68.63
19.79	81.13	19.79	78.46	19.79	61.5	19.79	73.70
22.21	85.39	22.21	84.24	22.21	65.44	22.21	78.36
24.69	90.19	24.69	89.85	24.69	69.16	24.69	83.07
27.10	95.99	27.10	95.49	27.10	72.76	27.10	88.08
29.59	100.2	29.59	100.2	29.59	76.96	29.59	92.45
32.00	105.9	32.00	105.5	32.00	80.98	32.00	97.46
34.48	109.9	34.48	109.7	34.48	85.01	34.48	101.54
34.48	110.1	34.48	109.8	34.48	84.81	34.48	101.57
32.69	105.6	32.69	105.2	32.69	81.82	32.69	97.54
30.90	101.1	30.90	99.94	30.90	78.62	30.90	93.22
29.03	97.11	29.10	95.69	29.03	75.49	29.06	89.43
27.24	91.53	27.24	92.05	27.24	72.71	27.24	85.43
25.45	88.47	25.45	87.39	25.45	69.45	25.45	81.77
23.66	83.17	23.66	83.8	23.66	66.54	23.66	77.84
21.86	80.47	21.86	79.11	21.86	63.03	21.86	74.20
20.07	75.92	20.00	74.92	20.07	59.92	20.05	70.25
18.28	71.5	18.21	71.58	18.21	57.03	18.23	66.70
16.41	67.05	16.41	67.3	16.41	53.78	16.41	62.71
14.62	63.03	14.62	61.86	14.62	49.96	14.62	58.28
12.83	58.42	12.83	57.5	12.83	46.36	12.83	54.09
11.03	53.2	11.03	52.74	11.03	42.99	11.03	49.64
9.24	48.68	9.24	47.98	9.24	39.05	9.24	45.24
7.45	43.71	7.45	43.05	7.45	35.37	7.45	40.71
5.62	30.47	5.59	38.31	5.61	31.49	5.61	33.42
3.80	32.69	3.80	32.76	3.79	27.02	3.80	30.82
2.01	26.38	1.99	26.86	2.01	22.41	2.00	25.22
0.20	19.01	0.20	19.42	0.20	16.16	0.20	18.20

					Average	Stdev
YS	22.4		23.6		20.3	22.1	1.7
VS	2.6		2.5		1.9	2.3	0.4
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	238		86		80	135	89

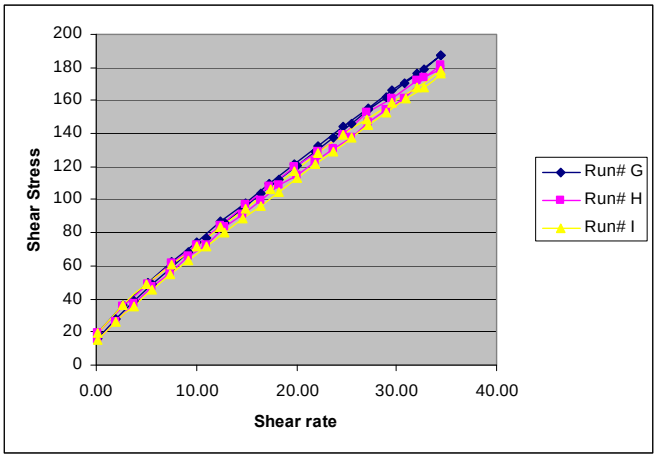


Comment: Problem with mixer = material not mixed properly - a lot of sedimentation

Set A7: CS-BX5 – BL45- L2 – 7 day – NIST code (folder SR 39-SR-36A)

SR-36A							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	19.03	0.20	19.05	0.20	19.23	0.20	19.10
2.65	35.97	2.63	35.64	2.63	36.01	2.64	35.87
5.10	49.66	5.10	49	5.08	48.8	5.09	49.15
7.52	62.15	7.52	61.22	7.52	60.65	7.52	61.34
10.00	74.61	10.00	72.81	10.00	72.08	10.00	73.17
12.41	86.5	12.41	84.48	12.41	83.58	12.41	84.85
14.90	98.09	14.90	96.85	14.90	94.82	14.90	96.59
17.31	109.7	17.31	108.4	17.38	106.6	17.33	108.23
19.79	121.4	19.79	120.1	19.79	117.3	19.79	119.60
22.21	132.9	22.21	129.2	22.21	128.6	22.21	130.23
24.69	144.1	24.69	139.5	24.69	139	24.69	140.87
27.17	155.1	27.10	152.5	27.10	148.3	27.13	151.97
29.59	166.1	29.59	160.9	29.59	159	29.59	162.00
32.00	176.6	32.00	172.5	32.00	168	32.00	172.37
34.48	187.2	34.48	178.6	34.48	178.4	34.48	181.40
34.48	187	34.48	181.8	34.48	176.6	34.48	181.80
32.69	178.7	32.69	173.5	32.69	168.3	32.69	173.50
30.83	170.4	30.83	161.5	30.90	160.9	30.85	164.27
29.03	162.3	29.03	154.7	29.03	152.7	29.03	156.57
27.24	154.4	27.24	146.5	27.24	145.2	27.24	148.70
25.45	145.8	25.45	137.9	25.45	137.4	25.45	140.37
23.66	137.9	23.66	130.7	23.66	129.4	23.66	132.67
21.86	129.3	21.86	123.5	21.86	121.2	21.86	124.67
20.07	120.8	20.07	114.7	20.07	113.3	20.07	116.27
18.28	112.4	18.28	108.6	18.21	104.5	18.25	108.50
16.41	103.7	16.41	100	16.41	96.57	16.41	100.09
14.62	94.82	14.62	90.77	14.62	88.75	14.62	91.45
12.83	86.14	12.83	83.23	12.83	79.8	12.83	83.06
11.03	76.99	11.03	72.76	11.03	72.02	11.03	73.92
9.24	68	9.24	65.6	9.24	62.99	9.24	65.53
7.38	58.22	7.45	55.42	7.45	54.62	7.43	56.09
5.61	48.79	5.61	47.04	5.61	45.16	5.61	47.00
3.82	38.96	3.83	37.37	3.80	35.74	3.82	37.36
2.01	28.14	2.01	26.28	2.02	26.12	2.01	26.85
0.20	15.85	0.20	14.81	0.20	14.84	0.20	15.17

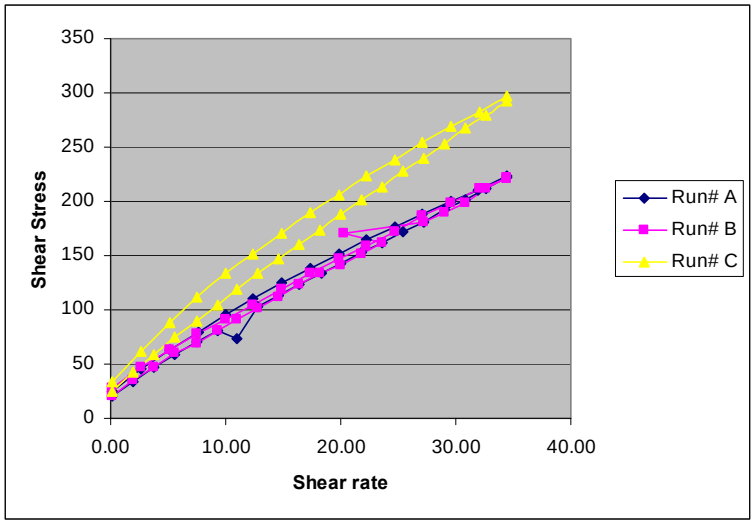
					Average	Stdev
YS	21.0		19.8	18.9	19.9	1.1
VS	4.9		4.7	4.6	4.7	0.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	66		261	107	145	103



Set A7: CS-BX5 – BL12- L2 – 7 day – NIST code (folder SR 39-SR-36B)

SR-36B							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	25.25	0.20	27.26	0.20	33.14	0.20	28.55
2.64	46.14	2.65	47.13	2.65	62.46	2.65	51.91
5.10	62.9	5.10	62.72	5.09	87.59	5.09	71.07
7.59	79.28	7.52	77.4	7.52	112.3	7.54	89.66
10.00	95.53	10.00	91.28	10.00	133.1	10.00	106.64
12.41	110.5	12.41	105	12.41	152.1	12.41	122.53
14.90	125	14.90	119.6	14.90	171.1	14.90	138.57
17.31	138.8	17.38	133.4	17.38	189.3	17.36	153.83
19.79	151.8	19.79	147.2	19.79	206.3	19.79	168.43
22.21	164.6	22.21	158.9	22.21	222.9	22.21	182.13
24.69	176.8	24.69	171.6	24.69	238.9	24.69	195.77
27.10	187.9	27.10	186.7	27.10	254.2	27.10	209.60
29.59	199.4	29.59	198.8	29.59	269.1	29.59	222.43
32.00	211	32.07	211.7	32.07	283	32.05	235.23
34.48	224	34.48	220	34.48	297.1	34.48	247.03
34.48	222.2	34.48	222.6	34.48	293	34.48	245.93
32.69	212.4	32.69	212.4	32.62	279.1	32.67	234.63
30.90	202	30.90	199	30.90	267	30.90	222.67
29.03	193.1	29.03	189.5	29.03	253.4	29.03	212.00
27.24	181.1	27.24	181.6	27.24	240.1	27.24	200.93
25.45	172.3	20.34	170.3	25.45	227.3	23.75	189.97
23.66	161.7	23.66	162.4	23.66	213.9	23.66	179.33
21.86	153.4	21.86	151.3	21.86	200.9	21.86	168.53
20.07	142.7	20.07	141.4	20.07	187.7	20.07	157.27
18.28	133.1	18.21	133.9	18.21	173.5	18.23	146.83
16.41	123	16.41	123.9	16.41	160.1	16.41	135.67
14.62	112.8	14.62	111.5	14.62	147.1	14.62	123.80
12.83	102.7	12.83	102	12.83	133.1	12.83	112.60
11.03	72.88	11.03	91.2	11.03	119.3	11.03	94.46
9.24	81.38	9.24	80.78	9.24	104.7	9.24	88.95
7.45	69.86	7.45	69.62	7.45	90.39	7.45	76.62
5.61	59.06	5.61	59.58	5.61	75.02	5.61	64.55
3.80	47.31	3.80	47.64	3.81	59.41	3.80	51.45
2.01	34.46	2.01	34.96	2.01	42.97	2.01	37.46
0.20	20.34	0.21	20.81	0.20	24.47	0.20	21.87

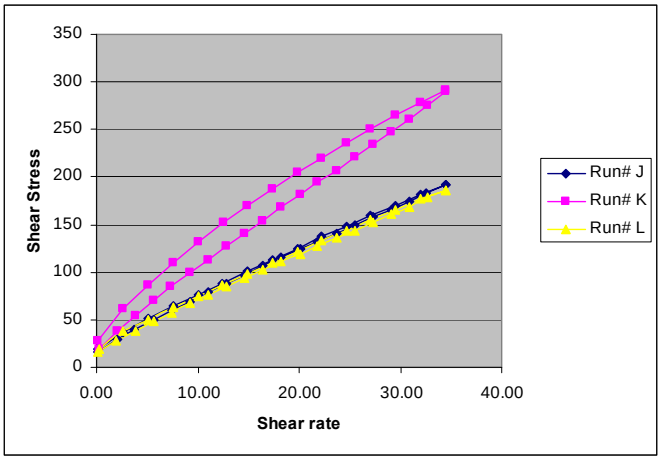
				Average	Stdev
YS	24.1	27.0	31.3	27.5	3.6
VS	5.8	5.8	7.7	6.4	1.1
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	241	231	441	304	119



Set A7: CS-BX5 – BL12- L1 – 7 day – NIST code (folder SR 39-SR-36C)

SR-36C							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	19.76	0.20	27.17	0.21	19.76	0.20	22.23
2.64	36.73	2.65	61.63	2.66	37.35	2.65	45.24
5.08	51.02	5.10	86.46	5.10	50.3	5.10	62.59
7.59	64.19	7.52	109.4	7.52	62.91	7.54	78.83
10.00	76.36	10.00	132.3	10.00	74.69	10.00	94.45
12.41	88.47	12.48	151.6	12.41	86.52	12.44	108.86
14.90	100.9	14.90	170.2	14.90	98.79	14.90	123.30
17.38	113.2	17.38	187.7	17.31	110.4	17.36	137.10
19.79	125.2	19.79	204.6	19.79	122.2	19.79	150.67
22.21	137	22.21	220.2	22.21	132.9	22.21	163.37
24.69	148.3	24.69	235.6	24.69	144	24.69	175.97
27.10	159.5	27.10	251	27.10	155.7	27.10	188.73
29.59	170.6	29.59	264.6	29.59	166.2	29.59	200.47
32.00	181.2	32.00	278.9	32.00	176.9	32.00	212.33
34.48	192	34.48	292.1	34.48	186.1	34.48	223.40
34.48	191.3	34.48	289.6	34.48	186.5	34.48	222.47
32.62	182.8	32.69	275.1	32.69	178	32.67	211.97
30.90	174.4	30.83	260.9	30.83	168.7	30.85	201.33
29.03	166	29.03	247.3	29.03	160.5	29.03	191.27
27.24	157.9	27.24	233.6	27.24	152.9	27.24	181.47
25.45	149.4	25.45	220.6	25.45	144.1	25.45	171.37
23.66	141.1	23.66	207	23.66	136.4	23.66	161.50
21.86	132.3	21.86	194.4	21.86	127.5	21.86	151.40
20.07	123.8	20.07	181.2	20.07	119.1	20.07	141.37
18.21	115	18.21	167.7	18.21	111.2	18.21	131.30
16.41	106.3	16.41	154.3	16.41	102.6	16.41	121.07
14.62	97.25	14.62	140.8	14.62	93.43	14.62	110.49
12.83	88.1	12.83	127.4	12.83	84.81	12.83	100.10
11.03	79.14	11.03	113	11.03	76.03	11.03	89.39
9.24	69.48	9.24	99.35	9.24	66.74	9.24	78.52
7.45	60.07	7.38	84.46	7.45	57.63	7.43	67.39
5.61	50.15	5.60	69.6	5.59	48.36	5.60	56.04
3.79	39.8	3.82	54.31	3.81	38.44	3.81	44.18
2.01	28.87	2.01	37.96	1.99	27.85	2.00	31.56
0.20	16.28	0.21	19.53	0.20	15.9	0.20	17.24

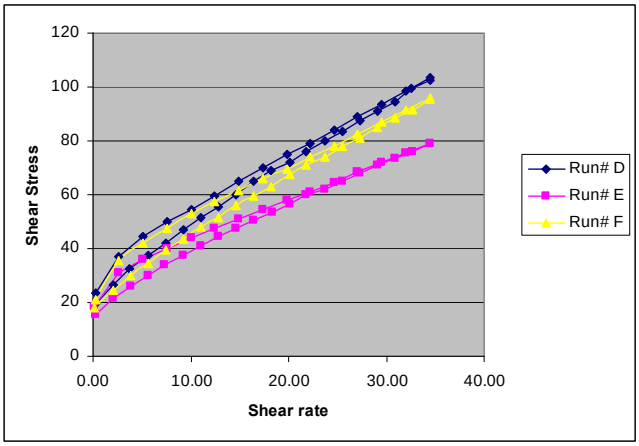
					Average	Stdev
YS	21.7		25.7	20.5	22.6	2.7
VS	5.0		7.7	4.9	5.9	1.6
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	65		612	140	272	297



Set A7: CS-BX5 – BL45- L1 – 7 day – NIST code (folder SR 39-SR-36D)

SR-36D							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	23.29	0.20	18.63	0.21	21	0.20	20.97
2.65	36.82	2.63	31	2.64	35.74	2.64	34.52
5.09	44.34	5.10	35.81	5.10	41.97	5.10	40.71
7.59	50.19	7.52	39.86	7.52	47.6	7.54	45.88
10.00	54.68	10.00	43.79	10.00	52.8	10.00	50.42
12.41	59.73	12.41	47.41	12.41	57.32	12.41	54.82
14.90	65.1	14.90	51.06	14.90	61.34	14.90	59.17
17.38	69.99	17.31	54.47	17.31	65.77	17.33	63.41
19.79	74.94	19.79	57.88	19.79	69.75	19.79	67.52
22.21	79.22	22.28	61.2	22.21	73.99	22.23	71.47
24.69	83.86	24.69	64.7	24.69	78.2	24.69	75.59
27.10	89.13	27.10	68.3	27.10	82.45	27.10	79.96
29.59	93.58	29.59	71.86	29.59	86.9	29.59	84.11
32.00	98.69	32.00	75.37	32.00	91.27	32.00	88.44
34.48	102.7	34.48	79.09	34.48	96.17	34.48	92.65
34.48	103.3	34.48	78.94	34.48	95.4	34.48	92.55
32.62	99.38	32.69	76.11	32.69	91.75	32.67	89.08
30.90	94.74	30.83	73.38	30.90	88.58	30.87	85.57
29.03	91.03	29.03	70.84	29.03	85.11	29.03	82.33
27.24	87.52	27.24	67.76	27.24	81.16	27.24	78.81
25.45	83.62	25.45	65.16	25.45	77.83	25.45	75.54
23.66	79.96	23.66	62.16	23.66	73.98	23.66	72.03
21.86	76.02	21.86	59.78	21.86	70.9	21.86	68.90
20.07	72.13	20.07	56.74	20.07	67.37	20.07	65.41
18.21	68.92	18.28	53.4	18.21	63.06	18.23	61.79
16.41	64.86	16.41	50.31	16.41	59.3	16.41	58.16
14.62	59.93	14.62	47.61	14.62	56.06	14.62	54.53
12.83	55.7	12.83	44.33	12.83	51.71	12.83	50.58
11.03	51.4	11.03	40.77	11.03	47.96	11.03	46.71
9.24	46.77	9.24	37.6	9.24	43.53	9.24	42.63
7.45	42.19	7.38	33.79	7.45	39.55	7.43	38.51
5.61	37.7	5.60	29.88	5.61	34.57	5.61	34.05
3.79	32.3	3.82	25.95	3.82	29.88	3.81	29.38
2.02	26.75	2.01	21.54	2.01	24.64	2.01	24.31
0.21	19.6	0.21	15.69	0.20	17.94	0.20	17.74

					Average	Stdev
YS	24.0		19.9	22.2	22.0	2.1
VS	2.3		1.8	2.2	2.1	0.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	155		95	123	125	30

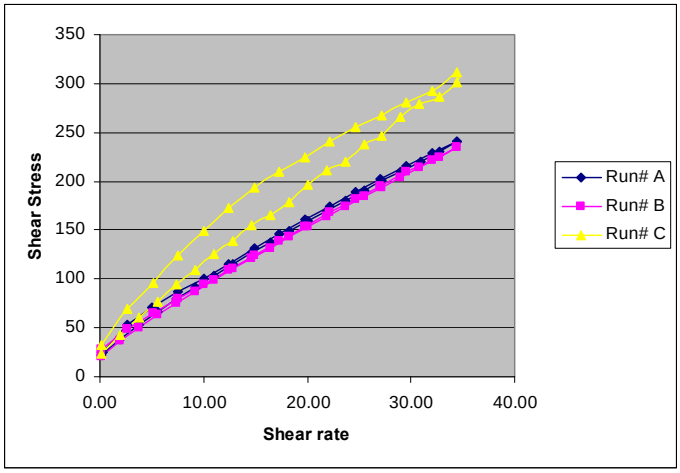


Comment: Problem with mixer = material not mixed properly - a lot of sedimentation

Set B1: CS-BX1 – BL23- L2 – Mixing Day – NIST code (folder SR 41-SR-40A)

SR-40A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	24.84	0.20	28.25	0.20	32.03	0.23	28.37
2.64	53.58	2.66	48.80	2.64	68.97	2.65	57.12
5.08	70.61	5.10	64.91	5.10	95.38	5.09	76.97
7.59	86.67	7.52	79.40	7.52	124.00	7.54	96.69
10.00	101.10	10.00	94.58	10.00	149.70	10.00	115.13
12.41	115.90	12.41	109.30	12.41	172.30	12.41	132.50
14.90	131.20	14.90	124.20	14.90	193.20	14.90	149.53
17.31	146.10	17.31	139.10	17.31	209.20	17.31	164.80
19.79	160.70	19.79	153.40	19.79	224.70	19.79	179.60
22.21	174.80	22.21	167.70	22.21	240.20	22.21	194.23
24.69	188.60	24.69	181.80	24.69	255.20	24.69	208.53
27.10	202.10	27.10	195.60	27.17	267.20	27.13	221.63
29.59	215.30	29.59	209.00	29.59	280.20	29.59	234.83
32.00	228.50	32.00	222.10	32.00	292.90	32.00	247.83
34.48	240.90	34.48	234.50	34.48	311.60	34.48	262.33
34.48	241.10	34.48	234.50	34.48	301.70	34.48	259.10
32.69	230.90	32.69	224.40	32.69	286.90	32.69	247.40
30.90	220.30	30.83	214.00	30.83	278.70	30.85	237.67
29.03	210.30	29.03	204.40	29.03	265.70	29.03	226.80
27.24	200.20	27.24	194.10	27.24	246.80	27.24	213.70
25.45	190.00	25.45	183.90	25.45	237.50	25.45	203.80
23.66	179.90	23.66	173.90	23.66	220.20	23.66	191.33
21.86	169.70	21.86	163.70	21.86	211.00	21.86	181.47
20.07	159.00	20.07	153.10	20.07	197.10	20.07	169.73
18.21	148.60	18.28	142.80	18.28	179.40	18.25	156.93
16.41	137.60	16.41	132.10	16.41	165.50	16.41	145.07
14.62	126.30	14.62	121.10	14.62	154.60	14.62	134.00
12.83	114.90	12.83	110.10	12.83	139.50	12.83	121.50
11.03	103.30	11.03	98.55	11.03	124.80	11.03	108.88
9.24	91.21	9.24	87.15	9.24	109.70	9.24	96.02
7.45	79.12	7.45	75.16	7.45	94.24	7.45	82.84
5.62	66.55	5.61	62.93	5.60	76.72	5.61	68.73
3.81	52.95	3.81	50.19	3.82	60.43	3.81	54.52
2.01	38.90	1.99	36.47	2.01	43.03	2.01	39.47
0.20	22.77	0.19	21.18	0.21	23.47	0.20	22.47

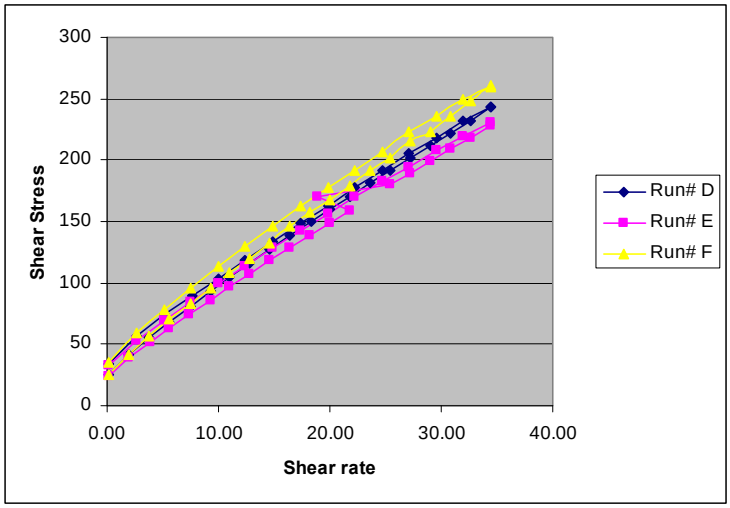
					Average	Stdev
YS	31.2		28.5	32.3	30.7	2.0
VS	6.2		6.1	8.0	6.8	1.1
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	137		94	510	247	229



Set B1: CS-BX1 – BL23- L1 – Mixing Day – NIST code (folder SR 41-SR-40B)

SR-40B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	34.42	0.20	33.19	0.20	34.89	0.20	34.17
2.63	56.99	2.64	53.57	2.65	59.73	2.64	56.76
5.09	74.18	5.10	69.61	5.08	78.08	5.09	73.96
7.59	88.97	7.52	84.83	7.52	95.67	7.54	89.82
10.00	103.40	10.00	99.52	10.00	113.10	10.00	105.34
12.41	118.20	12.41	114.00	12.41	129.50	12.41	120.57
14.90	133.40	14.90	128.50	14.90	145.60	14.90	135.83
17.38	148.40	17.31	142.80	17.31	162.20	17.33	151.13
19.79	163.20	19.79	156.30	19.79	177.60	19.79	165.70
22.21	177.40	22.21	170.20	22.21	191.70	22.21	179.77
24.69	191.30	24.69	183.10	24.69	206.30	24.69	193.57
27.10	205.30	27.10	194.60	27.10	222.50	27.10	207.47
29.59	218.60	29.59	207.50	29.59	235.90	29.59	220.67
32.00	231.70	32.00	218.70	32.00	249.80	32.00	233.40
34.48	243.80	34.48	231.10	34.48	259.80	34.48	244.90
34.48	243.40	34.48	228.70	34.48	260.30	34.48	244.13
32.69	232.50	32.69	218.50	32.62	248.30	32.67	233.10
30.90	221.80	30.90	209.30	30.90	235.40	30.90	222.17
29.03	211.40	29.03	198.90	29.03	223.50	29.03	211.27
27.24	201.40	27.24	189.50	27.24	215.00	27.24	201.97
25.45	191.10	25.45	179.80	25.45	201.30	25.45	190.73
23.66	181.00	18.90	169.90	23.66	191.90	22.07	180.93
21.86	170.30	21.86	159.20	21.86	178.40	21.86	169.30
20.07	159.80	20.07	149.30	20.07	167.20	20.07	158.77
18.28	149.60	18.21	138.90	18.21	157.10	18.23	148.53
16.41	138.80	16.41	128.60	16.41	145.60	16.41	137.67
14.62	127.20	14.62	118.30	14.62	131.90	14.62	125.80
12.83	116.10	12.83	107.50	12.83	120.20	12.83	114.60
11.03	104.70	11.03	97.37	11.03	108.40	11.03	103.49
9.24	92.73	9.24	86.02	9.24	95.54	9.24	91.43
7.45	80.74	7.38	74.82	7.45	83.04	7.43	79.53
5.62	68.45	5.60	63.03	5.61	70.28	5.61	67.25
3.81	55.12	3.82	51.08	3.81	56.32	3.81	54.17
2.01	41.16	2.01	38.67	2.01	41.79	2.01	40.54
0.20	25.53	0.21	24.14	0.20	25.20	0.20	24.96

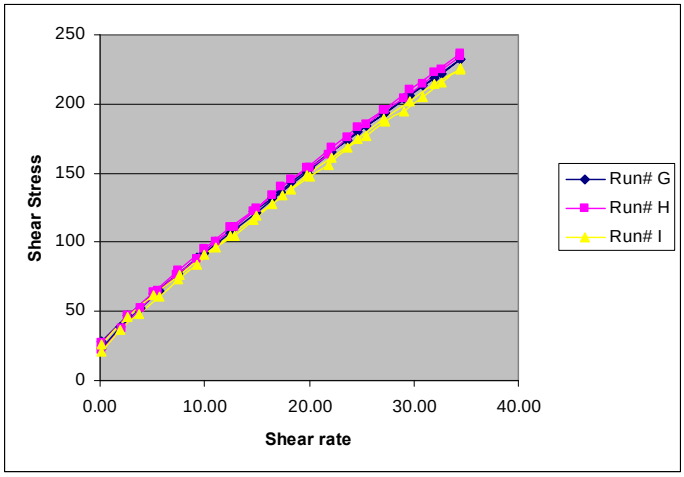
				Average	Stdev
YS	33.1	31.1	31.8	32.0	1.0
VS	6.2	5.9	6.7	6.3	0.4
R2	1.00	0.99	1.00	1.0	0.0
Hysteresis	174	137	365	225	122



Set B1: CS-BX1 – BL28- L2 – Mixing Day – NIST code (folder SR 41-SR-40C)

SR-40C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	28.24	0.19	27.00	0.19	26.25	0.19	27.16
2.66	47.24	2.65	46.90	2.65	45.98	2.65	46.71
5.10	62.69	5.11	63.54	5.09	61.24	5.10	62.49
7.52	77.32	7.52	79.70	7.59	76.80	7.54	77.94
10.00	92.55	10.00	95.45	10.00	91.03	10.00	93.01
12.41	107.10	12.41	110.50	12.41	105.10	12.41	107.57
14.90	121.50	14.90	124.50	14.90	119.70	14.90	121.90
17.31	136.40	17.31	139.90	17.38	134.30	17.33	136.87
19.79	150.60	19.79	153.70	19.79	148.40	19.79	150.90
22.21	165.40	22.21	168.90	22.21	161.50	22.21	165.27
24.69	179.40	24.69	182.90	24.69	174.80	24.69	179.03
27.10	192.40	27.10	196.10	27.10	189.20	27.10	192.57
29.59	206.10	29.59	210.60	29.59	201.80	29.59	206.17
32.00	219.10	32.00	222.80	32.00	214.90	32.00	218.93
34.48	232.60	34.48	236.40	34.48	224.60	34.48	231.20
34.48	231.70	34.48	234.50	34.48	225.60	34.48	230.60
32.69	221.90	32.69	225.00	32.69	215.60	32.69	220.83
30.83	213.00	30.90	214.50	30.90	204.80	30.87	210.77
29.03	203.60	29.03	203.50	29.03	194.40	29.03	200.50
27.24	193.10	27.24	196.10	27.24	187.40	27.24	192.20
25.45	183.80	25.45	184.70	25.45	176.70	25.45	181.73
23.66	173.60	23.66	176.00	23.66	168.10	23.66	172.57
21.86	164.10	21.86	163.70	21.86	156.30	21.86	161.37
20.00	153.50	20.07	154.00	20.07	147.20	20.05	151.57
18.28	142.80	18.28	145.10	18.21	137.60	18.25	141.83
16.41	132.30	16.41	134.40	16.41	127.50	16.41	131.40
14.62	122.20	14.62	121.90	14.62	116.20	14.62	120.10
12.83	111.20	12.83	111.00	12.83	104.90	12.83	109.03
11.03	99.96	11.03	100.60	11.03	95.77	11.03	98.78
9.24	88.71	9.24	88.24	9.24	83.39	9.24	86.78
7.45	76.76	7.38	76.65	7.45	72.96	7.43	75.46
5.61	64.56	5.60	64.88	5.61	60.78	5.61	63.41
3.81	51.96	3.82	51.87	3.80	48.22	3.81	50.68
1.99	38.22	2.01	38.10	2.01	36.10	2.00	37.47
0.20	23.08	0.20	22.43	0.20	21.27	0.20	22.26

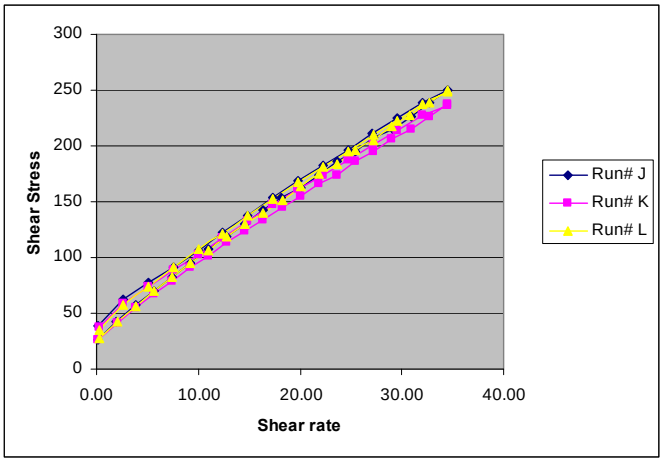
					Average	Stdev
YS	30.9		30.4	28.0	29.8	1.6
VS	6.0		6.1	5.8	6.0	0.1
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	30		3	132	55	68



Set B1: CS-BX1 – BL28- L1 – Mixing Day – NIST code (folder SR 41-SR-40D)

SR-40D							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	38.14	0.21	37.07	0.21	35.02	0.20	36.74
2.63	62.06	2.64	59.36	2.64	57.10	2.64	59.51
5.10	77.06	5.10	73.85	5.10	74.31	5.10	75.07
7.52	91.77	7.52	88.68	7.52	90.87	7.52	90.44
10.00	106.70	10.00	103.00	10.00	107.10	10.00	105.60
12.41	122.00	12.41	117.70	12.41	121.40	12.41	120.37
14.90	137.70	14.90	132.90	14.90	137.00	14.90	135.87
17.31	153.20	17.31	147.10	17.31	152.30	17.31	150.87
19.79	168.20	19.79	161.50	19.79	167.40	19.79	165.70
22.21	182.00	22.21	174.10	22.21	181.00	22.21	179.03
24.69	196.20	24.69	187.10	24.69	195.20	24.69	192.83
27.10	211.60	27.17	201.80	27.17	210.40	27.15	207.93
29.59	225.40	29.59	213.20	29.59	222.80	29.59	220.47
32.00	238.70	32.00	226.90	32.00	237.50	32.00	234.37
34.48	250.00	34.48	236.80	34.48	249.20	34.48	245.33
34.48	250.10	34.48	237.40	34.48	249.60	34.48	245.70
32.69	239.10	32.69	226.80	32.69	238.70	32.69	234.87
30.90	226.10	30.90	215.60	30.83	227.30	30.87	223.00
29.10	215.40	29.03	206.50	29.03	217.10	29.06	213.00
27.24	207.00	27.24	194.60	27.24	204.90	27.24	202.17
25.45	194.50	25.45	185.80	25.45	195.90	25.45	192.07
23.66	185.90	23.66	174.30	23.66	183.90	23.66	181.37
21.86	173.50	21.86	166.00	21.86	174.60	21.86	171.37
20.07	162.70	20.07	155.40	20.07	163.60	20.07	160.57
18.21	154.00	18.28	144.60	18.28	151.70	18.25	150.10
16.41	142.80	16.41	134.00	16.41	140.40	16.41	139.07
14.62	129.50	14.62	124.00	14.62	130.20	14.62	127.90
12.83	118.60	12.83	113.30	12.83	118.60	12.83	116.83
11.03	107.30	11.03	101.80	11.03	106.80	11.03	105.30
9.24	94.60	9.24	90.99	9.24	95.13	9.24	93.57
7.45	82.78	7.45	79.16	7.38	82.61	7.43	81.52
5.61	70.56	5.59	66.99	5.61	69.68	5.60	69.08
3.81	56.98	3.82	54.71	3.81	56.58	3.82	56.09
1.99	42.80	2.01	41.11	2.01	42.57	2.00	42.16
0.20	26.71	0.20	26.50	0.21	26.88	0.20	26.70

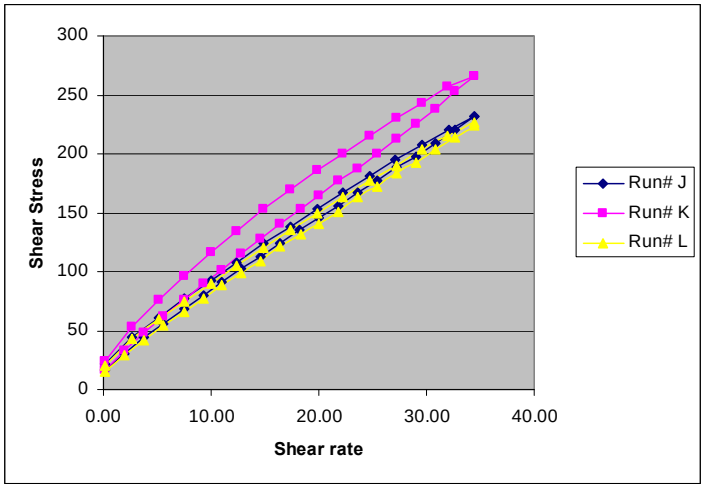
					Average	Stdev
YS	34.2		33.0	33.8	33.6	0.6
VS	6.3		6.0	6.3	6.2	0.2
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	241		273	206	240	33



Set B3: CS-BX1 – BL23- L2 – 4 day – NIST code (folder SR 42-SR-40A)

SR-40A							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	21.31	0.20	23.86	0.20	20.49	0.20	21.89
2.64	44.06	2.63	52.97	2.65	42.82	2.64	46.62
5.09	60.5	5.10	75.4	5.11	59.6	5.10	65.17
7.52	77.05	7.52	96.28	7.52	74.93	7.52	82.75
10.00	92.52	10.00	116.3	10.00	90.11	10.00	99.64
12.41	108.1	12.41	134.6	12.41	105.2	12.41	115.97
14.90	123.6	14.90	152.8	14.90	119.9	14.90	132.10
17.31	138.4	17.31	169.4	17.31	135	17.31	147.60
19.79	153.3	19.79	186.2	19.79	148.9	19.79	162.80
22.21	167.2	22.21	200.5	22.28	163.7	22.23	177.13
24.69	180.8	24.69	215	24.69	177.2	24.69	191.00
27.10	194.5	27.17	230.9	27.17	189.7	27.15	205.03
29.59	207.5	29.59	242.7	29.59	203.4	29.59	217.87
32.07	220.1	32.00	256.4	32.00	215	32.02	230.50
34.48	231.8	34.48	266.1	34.48	226.8	34.48	241.57
34.48	231.3	34.48	266.3	34.48	224.1	34.48	240.57
32.69	220.2	32.69	252.9	32.69	213.4	32.69	228.83
30.90	208.8	30.83	237.4	30.90	203.6	30.87	216.60
29.03	198	29.03	225.7	29.03	191.9	29.03	205.20
27.24	188	27.24	212.1	27.24	184.1	27.24	194.73
25.45	176.9	25.45	200.5	25.45	172.3	25.45	183.23
23.66	166.8	23.66	187.8	23.66	163.5	23.66	172.70
21.86	156.1	21.86	177.4	21.86	150.7	21.86	161.40
20.07	145.3	20.07	164.4	20.07	140.8	20.07	150.17
18.21	135.1	18.28	152.7	18.28	131.9	18.25	139.90
16.41	124.4	16.41	140.1	16.41	121.3	16.41	128.60
14.62	113	14.62	127.6	14.62	109.1	14.62	116.57
12.83	102.3	12.83	115.7	12.83	98.75	12.83	105.58
11.03	91.02	11.03	101.6	11.03	88.2	11.03	93.61
9.24	79.6	9.24	89.59	9.24	76.86	9.24	82.02
7.45	67.9	7.45	75.34	7.45	65.32	7.45	69.52
5.61	56.15	5.61	62.14	5.60	54.42	5.61	57.57
3.80	43.68	3.81	48.08	3.81	42.36	3.81	44.71
2.01	30.75	2.00	32.76	2.01	29.56	2.01	31.02
0.20	16.31	0.19	16.28	0.20	15.3	0.20	15.96

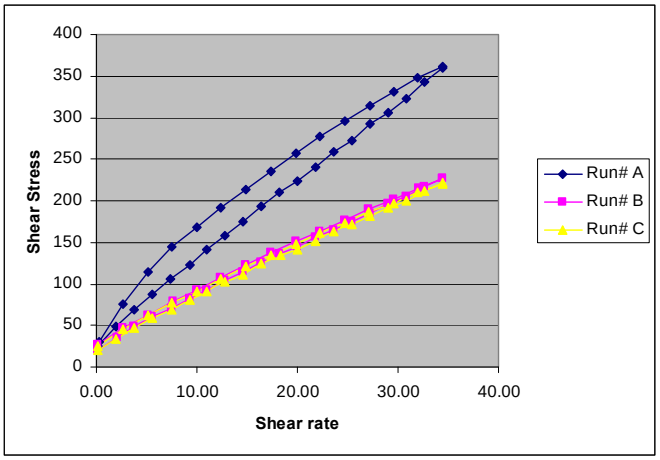
					Average	Stdev
YS	21.1		21.4	20.1	20.9	0.7
VS	6.1		7.1	6.0	6.4	0.6
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	241		624	181	349	240



Set B3: CS-BX1 – BL23- L1 – 4 day – NIST code (folder SR 42-SR-40B)

SR-40B							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.23	30.32	0.21	26.19	0.20	25.58	0.21	27.36
2.63	75.51	2.65	46.92	2.64	45.09	2.64	55.84
5.10	114.3	5.09	62.89	5.10	62.02	5.10	79.74
7.52	144.6	7.59	78.55	7.52	77.08	7.54	100.08
10.00	168.1	10.00	93.19	10.00	91.58	10.00	117.62
12.41	191.9	12.41	107.9	12.41	105.9	12.41	135.23
14.90	214	14.90	123	14.90	120.6	14.90	152.53
17.31	235.7	17.38	137.3	17.31	133.9	17.33	168.97
19.79	256.5	19.79	151.5	19.79	147.9	19.79	185.30
22.28	276.9	22.21	163.1	22.21	161.1	22.23	200.37
24.69	295.5	24.69	176.4	24.69	173.7	24.69	215.20
27.17	314.8	27.10	189.4	27.10	186.3	27.13	230.17
29.59	331.6	29.59	201.1	29.59	197.1	29.59	243.27
32.00	347.9	32.07	214.3	32.00	210.3	32.02	257.50
34.48	361.5	34.48	226.2	34.48	220.9	34.48	269.53
34.48	359.4	34.48	226.4	34.48	222	34.48	269.27
32.69	342.5	32.69	216.6	32.69	212.2	32.69	257.10
30.90	322.2	30.90	204.5	30.83	199.8	30.87	242.17
29.03	305.1	29.03	195.8	29.03	191.1	29.03	230.67
27.24	292.3	27.24	184.3	27.24	181.3	27.24	219.30
25.45	272.8	25.45	174.8	25.45	170.7	25.45	206.10
23.66	259.2	23.66	164.6	23.66	162.3	23.66	195.37
21.86	240.3	21.86	156	21.86	151.8	21.86	182.70
20.07	223.9	20.00	145.2	20.00	141.6	20.02	170.23
18.21	209.6	18.21	136	18.28	134.1	18.23	159.90
16.41	193.3	16.41	125.5	16.41	123.9	16.41	147.57
14.62	174.4	14.62	114.6	14.62	111.6	14.62	133.53
12.83	158.1	12.83	104.7	12.83	101.9	12.83	121.57
11.03	140.5	11.03	92.72	11.03	91.27	11.03	108.16
9.24	123.5	9.24	82.67	9.24	80.52	9.24	95.56
7.38	105.1	7.45	70.82	7.45	69.35	7.43	81.76
5.60	87.79	5.61	59.99	5.60	58.87	5.60	68.88
3.81	68.81	3.81	47.95	3.81	46.87	3.81	54.54
2.01	48.49	2.02	34.58	2.00	34.2	2.01	39.09
0.20	26.01	0.20	20.3	0.20	20.08	0.20	22.13

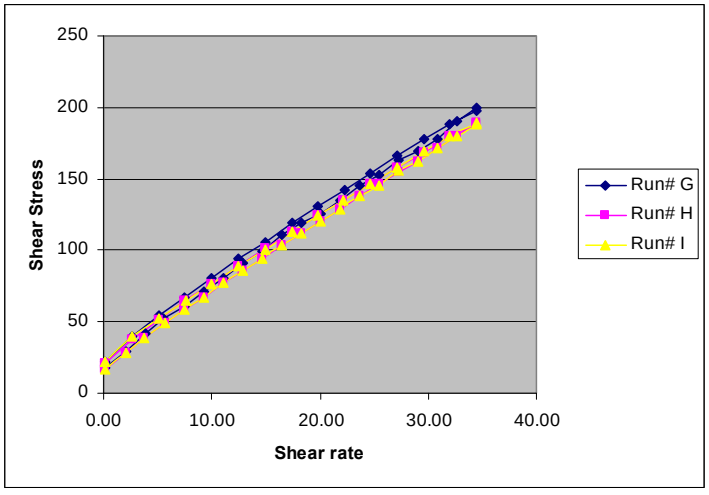
					Average	Stdev
YS	33.2		26.3	25.8	28.4	4.2
VS	9.5		5.9	5.7	7.0	2.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	885		195	232	437	388



Set B3: CS-BX1 – BL28- L2 – 4 day – NIST code (folder SR 42-SR-40C)

SR-40C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	22.45	0.21	20.89	0.20	21.96	0.20	21.77
2.65	39.94	2.64	38.11	2.66	39.65	2.65	39.23
5.10	54.21	5.09	51.27	5.09	52.45	5.09	52.64
7.52	67.14	7.52	64.34	7.59	64.59	7.54	65.36
10.00	80.7	10.00	76.83	10.00	76.54	10.00	78.02
12.41	93.67	12.41	88.95	12.41	88.6	12.41	90.41
14.90	105.5	14.90	101	14.90	100.4	14.90	102.30
17.38	119	17.38	112.8	17.38	112.9	17.38	114.90
19.79	130.3	19.79	124.2	19.79	124.1	19.79	126.20
22.28	142.4	22.21	135.2	22.21	135.4	22.23	137.67
24.69	153.9	24.69	146.1	24.69	146.6	24.69	148.87
27.10	166	27.10	157.7	27.10	158.2	27.10	160.63
29.59	178	29.59	168.5	29.59	169.4	29.59	171.97
32.00	188.7	32.00	179.4	32.00	179.8	32.00	182.63
34.48	197.3	34.48	188.8	34.48	189.1	34.48	191.73
34.48	199.3	34.48	188.9	34.48	188.6	34.48	192.27
32.69	190.1	32.69	180.4	32.69	180	32.69	183.50
30.90	178	30.90	171.2	30.90	171.2	30.90	173.47
29.03	169.4	29.03	162.6	29.03	162.1	29.03	164.70
27.24	162.7	27.24	155.2	27.24	155.6	27.24	157.83
25.45	152.2	25.45	146.3	25.45	145.9	25.45	148.13
23.66	145.2	23.66	138.3	23.66	138.5	23.66	140.67
21.86	134.9	21.86	128.9	21.86	128.5	21.86	130.77
20.07	125.8	20.07	120.6	20.07	120.3	20.07	122.23
18.21	119.6	18.21	112.4	18.21	112.4	18.21	114.80
16.41	110.5	16.41	103.8	16.41	103.8	16.41	106.03
14.62	99.08	14.62	94.33	14.62	94.15	14.62	95.85
12.83	90.5	12.83	85.51	12.83	85.31	12.83	87.11
11.03	80.27	11.03	76.94	11.03	76.94	11.03	78.05
9.24	71.44	9.24	67.35	9.24	67.27	9.24	68.69
7.45	60.95	7.45	58.29	7.45	58.24	7.45	59.16
5.60	51.97	5.61	49.05	5.62	48.94	5.61	49.99
3.82	41.39	3.79	39.05	3.80	38.96	3.80	39.80
2.01	29.64	2.01	28.64	2.01	28.65	2.01	28.98
0.20	17.38	0.19	16.87	0.20	16.79	0.20	17.01

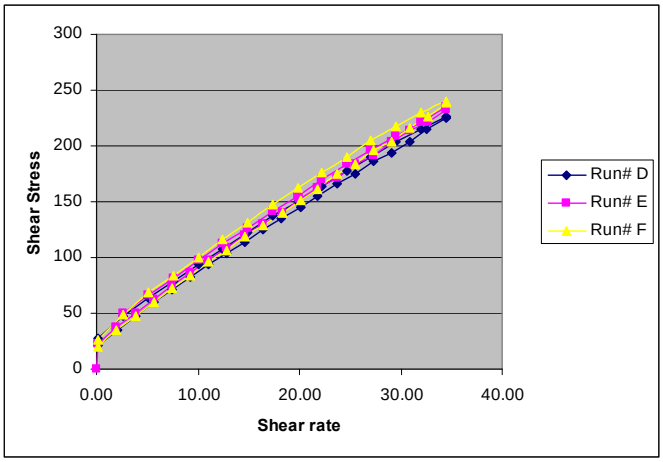
				Average	Stdev
YS	22.1	20.8	20.8	21.2	0.7
VS	5.2	4.9	4.9	5.0	0.1
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	230	150	144	175	48



Set B3: CS-BX1 – BL28- L1 – 4 day – NIST code (folder SR 42-SR-40D)

SR-40D							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	27.93	2.66	49.95	0.20	26.63	1.02	34.84
2.64	47.72	5.10	66.3	2.65	48.37	3.46	54.13
5.08	63.62	7.52	81.52	5.09	69.35	5.90	71.50
7.52	78.64	10.00	97.22	7.52	83.53	8.34	86.46
10.00	93.6	12.41	112.2	10.00	99.57	10.80	101.79
12.41	108	14.90	126.7	12.41	115.8	13.24	116.83
14.90	122.1	17.31	141.4	14.90	131.8	15.70	131.77
17.31	137.2	19.79	155.3	17.31	147.8	18.14	146.77
19.79	150.5	22.21	170.4	19.79	162.8	20.60	161.23
22.21	164.2	24.69	184.2	22.21	175.7	23.03	174.70
24.69	177.3	27.10	195.8	24.69	189.4	25.49	187.50
27.10	190.3	29.59	209.1	27.10	205	27.93	201.47
29.59	203.6	32.00	221.2	29.59	217.9	30.39	214.23
32.00	215.3	34.48	235.5	32.00	230.6	32.83	227.13
34.48	225.9	34.48	232.2	34.48	240.2	34.48	232.77
34.48	225	32.69	221.7	34.48	239.3	33.89	228.67
32.62	214.6	30.83	214.1	32.69	226.7	32.05	218.47
30.90	204.2	29.10	203.7	30.90	216	30.30	207.97
29.03	193.4	27.24	191.8	29.10	204	28.46	196.40
27.24	186.3	25.45	183.2	27.24	196.5	26.64	188.67
25.45	174.8	23.66	171.2	25.45	183.8	24.85	176.60
23.66	166.5	21.86	162.8	23.66	174.9	23.06	168.07
21.86	154.4	20.00	151.9	21.86	161.3	21.24	155.87
20.07	145	18.28	140.2	20.07	151.6	19.47	145.60
18.21	135.5	16.41	129.6	18.28	139.5	17.63	134.87
16.41	125.5	14.62	120	16.41	128.7	15.82	124.73
14.62	114.3	12.83	109.2	14.62	118.5	14.02	114.00
12.83	103.4	11.03	97.37	12.83	106.2	12.23	102.32
11.03	93.7	9.24	86.57	11.03	96.77	10.44	92.35
9.24	82.02	7.45	74.57	9.24	83.63	8.64	80.07
7.45	71.53	5.60	62.72	7.45	72.84	6.83	69.03
5.61	59.9	3.80	50.54	5.61	59.5	5.01	56.65
3.80	47.67	1.99	36.9	3.80	47.18	3.20	43.92
2.02	35.37	0.20	22.38	1.99	34.93	1.40	30.89
0.20	21.1	0.00	0	0.20	20.02	0.13	13.71

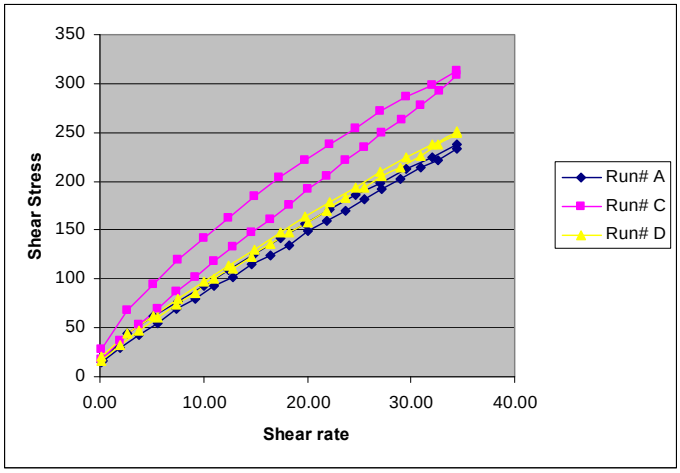
					Average	Stdev
YS	26.7		28.1	24.5	26.4	1.8
VS	5.8		6.1	6.3	6.1	0.2
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	185		332	327	281	84



Set B7: CS-BX1 – BL23- L2 – 7 day – NIST code (folder SR 43-SR-40A)

SR-40A							
Run# A		Run# C		Run# D		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.26	16.05	0.20	27.93	0.21	21.31	0.22	21.76
2.65	43.71	2.66	68.14	2.65	44.18	2.65	52.01
5.09	61.55	5.10	94.69	5.10	62.48	5.10	72.91
7.52	77.38	7.52	120.1	7.59	80.1	7.54	92.53
10.00	93.48	10.00	142.2	10.00	96.86	10.00	110.85
12.41	109.5	12.41	163	12.41	113.8	12.41	128.77
14.90	125	14.90	184.1	14.90	130.4	14.90	146.50
17.38	141.5	17.31	203.5	17.38	147.1	17.36	164.03
19.79	156.1	19.79	221.8	19.79	163.3	19.79	180.40
22.21	171.5	22.21	238.1	22.21	178.8	22.21	196.13
24.69	186.1	24.69	254.6	24.69	194	24.69	211.57
27.10	198.2	27.10	271	27.10	209.3	27.10	226.17
29.59	213.1	29.59	286.7	29.59	224	29.59	241.27
32.00	224.5	32.00	298.9	32.00	238.1	32.00	253.83
34.48	237.8	34.48	313.6	34.48	250.4	34.48	267.27
34.48	233	34.48	308.1	34.48	250	34.48	263.70
32.62	221.4	32.69	291.9	32.62	238.3	32.64	250.53
30.90	213.9	30.90	278	30.90	226.2	30.90	239.37
29.03	201.8	29.10	262.3	29.03	214	29.06	226.03
27.24	192.2	27.24	250.2	27.24	204.8	27.24	215.73
25.45	181.6	25.45	234.8	25.45	192.8	25.45	203.07
23.66	170.3	23.66	221.6	23.66	182.4	23.66	191.43
21.86	159.1	21.86	205.4	21.86	169.4	21.86	177.97
20.07	148.9	20.07	192	20.07	158.7	20.07	166.53
18.21	134.9	18.21	175.8	18.21	147.7	18.21	152.80
16.41	124.3	16.41	161.5	16.41	136.1	16.41	140.63
14.62	115.2	14.62	148.1	14.62	123.3	14.62	128.87
12.83	102.6	12.83	132.3	12.83	110.9	12.83	115.27
11.03	92.61	11.03	118.8	11.03	99.74	11.03	103.72
9.24	79.93	9.24	102.4	9.24	86.35	9.24	89.56
7.45	68.82	7.45	87.62	7.45	74.21	7.45	76.88
5.61	54.9	5.61	70.07	5.61	60.92	5.61	61.96
3.81	42.5	3.81	53.8	3.79	46.86	3.80	47.72
2.01	30.09	1.99	36.92	2.01	32.84	2.01	33.28
0.20	15.08	0.21	17.48	0.20	16.52	0.20	16.36

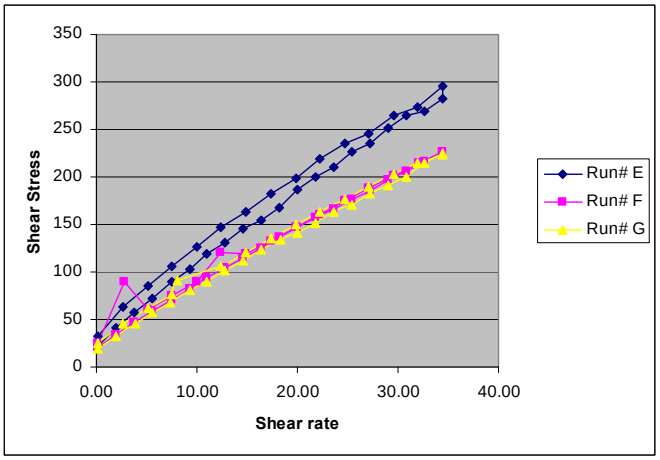
					Average	Stdev
YS	20.1		23.4	23.0	22.2	1.8
VS	6.3		8.3	6.7	7.1	1.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	119		718	166	334	333



Set B7: CS-BX1 – BL23- L1 – 7 day – NIST code (folder SR 43-SR-40B)

SR-40B							
Run# E		Run# F		Run# G		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	32.16	0.20	25.65	0.19	25.21	0.20	27.67
2.65	62.97	2.83	89.02	2.64	45.33	2.71	65.77
5.09	85.78	5.08	60.62	5.11	61.51	5.09	69.30
7.52	105.6	7.52	75.08	7.52	76.82	7.52	85.83
10.00	127.1	10.00	89.4	8.00	91.75	9.33	102.75
12.41	146.5	12.34	120.5	12.41	106.5	12.39	124.50
14.90	163.8	14.90	118.7	14.90	120.8	14.90	134.43
17.31	182.3	17.38	132.8	17.31	135.8	17.33	150.30
19.79	199	19.79	147.1	19.79	149.9	19.79	165.33
22.21	219.4	22.21	160.9	22.28	163.1	22.23	181.13
24.69	235.9	24.69	174.4	24.69	175.9	24.69	195.40
27.10	245.6	27.10	188	27.10	190.2	27.10	207.93
29.59	264.5	29.59	200.9	29.59	202.4	29.59	222.60
32.00	273.6	32.07	214.5	32.00	215	32.02	234.37
34.48	295.4	34.48	226.9	34.48	223.6	34.48	248.63
34.48	282.4	34.48	226.7	34.48	225.6	34.48	244.90
32.69	269.1	32.69	216.6	32.69	214.9	32.69	233.53
30.90	265.4	30.90	206.3	30.90	200.6	30.90	224.10
29.03	251.3	29.03	196.7	29.03	191	29.03	213.00
27.24	235.2	27.24	186	27.24	183	27.24	201.40
25.45	226.1	25.45	176.5	25.45	170.9	25.45	191.17
23.66	209.8	23.66	166.3	23.66	163	23.66	179.70
21.86	199.3	21.86	156.7	21.86	152	21.86	169.33
20.07	186.8	20.07	146.5	20.07	141.3	20.07	158.20
18.21	167.6	18.21	136.2	18.28	134.4	18.23	146.07
16.41	154.7	16.41	125.7	16.41	124.1	16.41	134.83
14.62	145.8	14.62	115.2	14.62	111.1	14.62	124.03
12.83	131	12.83	104.2	12.83	101.9	12.83	112.37
11.03	118.4	11.03	93.54	11.03	89.96	11.03	100.63
9.24	103.2	9.24	82.28	9.24	80.29	9.24	88.59
7.45	89.28	7.45	71.17	7.38	68.07	7.43	76.17
5.61	72.09	5.61	59.41	5.61	58.02	5.61	63.17
3.80	56.96	3.80	47.13	3.83	46.02	3.81	50.04
2.01	41.03	2.01	34.32	2.01	32.69	2.01	36.01
0.21	22.5	0.19	20.06	0.19	18.79	0.20	20.45

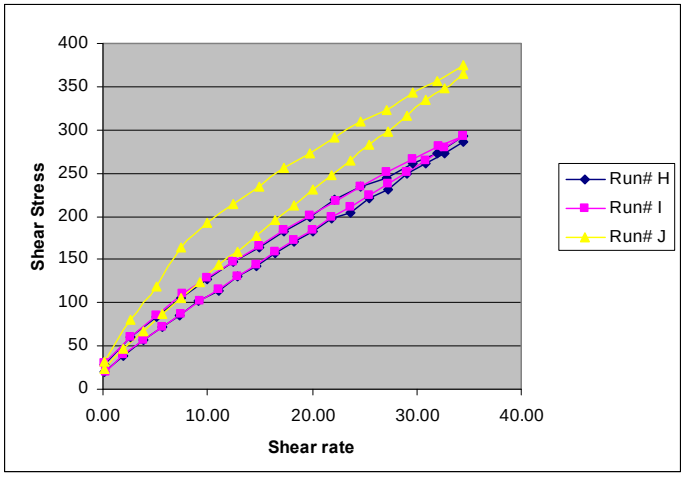
					Average	Stdev
YS	30.6		25.9	24.1	26.8	3.3
VS	7.5		5.9	5.8	6.4	1.0
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	67		228	348	215	141



Set B7: CS-BX1 – BL28- L2 – 7 day – NIST code (folder SR 43-SR-40C)

SR-40C							
Run# H		Run# I		Run# J		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	28.07	0.20	29.87	0.20	31.67	0.20	29.87
2.66	60.27	2.65	60.77	2.66	80.9	2.65	67.31
5.10	82.95	5.10	85.29	5.10	119.2	5.10	95.81
7.52	105.7	7.59	110.7	7.52	163.9	7.54	126.77
10.00	127.1	10.00	129.6	10.00	193	10.00	149.90
12.41	147.1	12.41	147.9	12.41	214.6	12.41	169.87
14.90	164.2	14.90	166	14.90	234.9	14.90	188.37
17.31	183.2	17.31	183.8	17.31	255.5	17.31	207.50
19.79	198.7	19.79	201.3	19.79	273.3	19.79	224.43
22.21	218.9	22.28	218.1	22.21	292	22.23	243.00
24.69	235.1	24.69	234.7	24.69	309	24.69	259.60
27.10	245	27.10	251.4	27.10	323.7	27.10	273.37
29.59	261.7	29.59	266.4	29.59	342.6	29.59	290.23
32.00	272.2	32.07	281.6	32.00	356.1	32.02	303.30
34.48	292.8	34.48	293.7	34.48	375.5	34.48	320.67
34.48	285.6	34.48	293.6	34.48	365.3	34.48	314.83
32.69	273.1	32.69	279.2	32.69	347.3	32.69	299.87
30.83	261.5	30.90	263.6	30.83	334.9	30.85	286.67
29.03	249.7	29.03	250.8	29.10	316.9	29.06	272.47
27.24	230.4	27.24	237.9	27.24	298.2	27.24	255.50
25.45	220.9	25.45	223.9	25.45	283.3	25.45	242.70
23.66	205	23.66	211.6	23.66	264.3	23.66	226.97
21.86	197.5	21.86	198.4	21.86	247.4	21.86	214.43
20.00	182.6	20.07	184.5	20.07	230.2	20.05	199.10
18.28	170.6	18.21	172.4	18.28	212.9	18.25	185.30
16.41	157.2	16.41	158.9	16.41	195.7	16.41	170.60
14.62	143	14.62	144.2	14.62	178.2	14.62	155.13
12.83	130.3	12.83	131	12.83	159.7	12.83	140.33
11.03	113.4	11.03	115.9	11.03	143.4	11.03	124.23
9.17	101.5	9.24	102.1	9.24	123.9	9.22	109.17
7.38	85.37	7.45	86.79	7.45	106.2	7.43	92.79
5.61	71.95	5.61	72.24	5.61	86.22	5.61	76.80
3.81	56.14	3.81	56.3	3.81	66.46	3.81	59.63
2.00	38.35	2.01	39.48	1.99	46.1	2.00	41.31
0.20	20.29	0.21	20.77	0.20	23.04	0.20	21.37

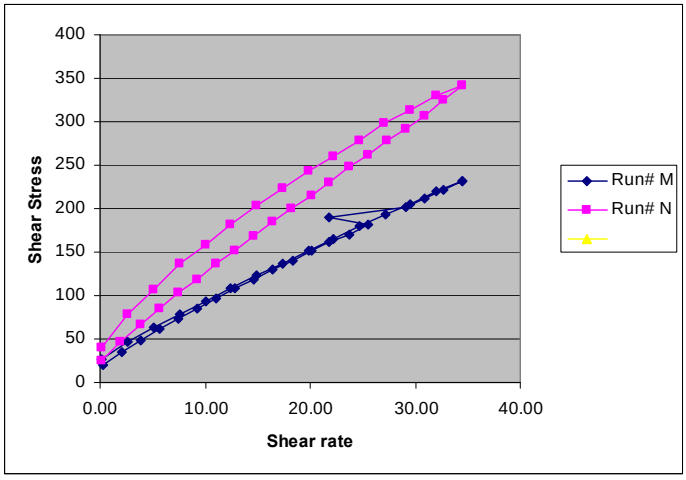
					Average	Stdev
YS	28.3		27.8	30.5	28.9	1.4
VS	7.6		7.7	9.9	8.4	1.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	293		547	964	601	339



Set B7: CS-BX1 – BL28- L1 – 7 day – NIST code (folder SR 43-SR-40D)

SR-40D							
Run# M		Run# N				Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	27.26	0.19	39.65			0.20	33.46
2.63	47.44	2.66	77.68			2.64	62.56
5.10	63.21	5.09	107.1			5.09	85.16
7.52	78.3	7.52	136.7			7.52	107.50
10.00	93.25	10.00	158.8			10.00	126.03
12.41	107.8	12.41	180.9			12.41	144.35
14.90	122.9	14.90	203.1			14.90	163.00
17.31	137.2	17.31	222.7			17.31	179.95
19.79	151.9	19.79	243.4			19.79	197.65
22.21	165.4	22.21	260.4			22.21	212.90
24.69	179.3	24.69	278.5			24.69	228.90
27.17	193.4	27.10	298.4			27.14	245.90
29.59	205.8	29.59	313.5			29.59	259.65
32.00	219.5	32.00	330.7			32.00	275.10
34.48	231.6	34.48	342			34.48	286.80
34.48	231.8	34.48	341.8			34.48	286.80
32.69	221.6	32.69	325.5			32.69	273.55
30.83	210.9	30.90	306.4			30.86	258.65
29.03	201.6	29.03	290.9			29.03	246.25
21.79	190.3	27.24	278.1			24.52	234.20
25.45	181.2	25.45	260.9			25.45	221.05
23.66	170.2	23.66	247.6			23.66	208.90
21.86	161.4	21.86	230			21.86	195.70
20.07	150.9	20.07	215.1			20.07	183.00
18.28	140.2	18.21	200.7			18.24	170.45
16.41	129.4	16.41	184.9			16.41	157.15
14.62	119.1	14.62	168.2			14.62	143.65
12.83	107.9	12.83	151.8			12.83	129.85
11.03	96.57	11.03	136.6			11.03	116.59
9.24	85.48	9.24	119			9.24	102.24
7.45	73.58	7.45	102.6			7.45	88.09
5.59	61.56	5.61	84.46			5.60	73.01
3.82	49.06	3.81	66.18			3.81	57.62
2.01	35.41	1.99	47.26			2.00	41.34
0.21	20.69	0.20	25.66			0.20	23.18

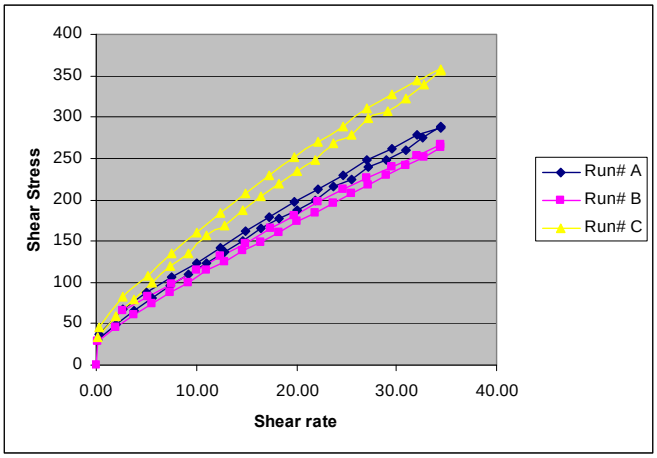
					Average	Stdev
YS	27.7		33.4		30.6	4.0
VS	6.1		9.0		7.5	2.0
R2	1.0		1.0		1.0	0.0
Hysteresis	59		852		456	561



Set C1: CS-BX3 – BL30- L1 – Mixing Day – NIST code (folder SR 45-SR-44A)

SR-44A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.22	36.72	2.65	65.05	0.21	46.15	1.03	49.31
2.65	68.35	5.09	82.07	2.66	81.98	3.46	77.47
5.08	87.49	7.59	98.28	5.10	108.4	5.92	98.06
7.59	105.7	10.00	114.8	7.52	135.7	8.37	118.73
10.00	123.5	12.41	131.2	10.00	160.1	10.80	138.27
12.41	141.6	14.90	147.6	12.41	183.5	13.24	157.57
14.90	161.4	17.38	164.6	14.90	207.7	15.72	177.90
17.31	179.3	19.79	180.2	17.31	229.8	18.14	196.43
19.79	197.7	22.21	196.7	19.79	251.4	20.60	215.27
22.21	212.5	24.69	211.9	22.21	269.8	23.03	231.40
24.69	228.7	27.10	225.4	24.69	289	25.49	247.70
27.10	247.8	29.59	240.2	27.10	310.1	27.93	266.03
29.59	262	32.00	252.5	29.59	328.2	30.39	280.90
32.00	277.8	34.48	267.1	32.00	344.6	32.83	296.50
34.48	286.9	34.48	262.8	34.48	357.7	34.48	302.47
34.48	288.8	32.69	251.1	34.48	356	33.89	298.63
32.62	275.7	30.90	241.6	32.69	339.8	32.07	285.70
30.90	260.6	29.03	229.6	30.90	322.9	30.28	271.03
29.03	247.9	27.24	218.3	29.10	306.9	28.46	257.70
27.24	239.6	25.45	207.8	27.24	298	26.64	248.47
25.45	224.5	23.66	196	25.45	279.1	24.85	233.20
23.66	215.3	21.86	184	23.66	268.4	23.06	222.57
21.86	199.5	20.07	173.4	21.86	248	21.26	206.97
20.07	188	18.21	160.4	20.07	234.6	19.45	194.33
18.21	177.9	16.41	148.9	18.21	219.6	17.61	182.13
16.41	165.5	14.62	137.8	16.41	203.9	15.82	169.07
14.62	149.5	12.83	125	14.62	187.2	14.02	153.90
12.83	136.4	11.03	114	12.83	169.4	12.23	139.93
11.03	124	9.24	100.4	11.03	156.3	10.44	126.90
9.24	109.2	7.45	88.3	9.24	135.5	8.64	111.00
7.45	95.56	5.61	74.02	7.45	119.4	6.84	96.33
5.61	81.6	3.81	60.03	5.60	98.87	5.01	80.17
3.80	65.59	2.01	45.57	3.80	78.81	3.20	63.32
2.01	49.16	0.20	28.36	2.00	58.72	1.40	45.41
0.20	29.92	0.00	0	0.21	33.7	0.14	21.21

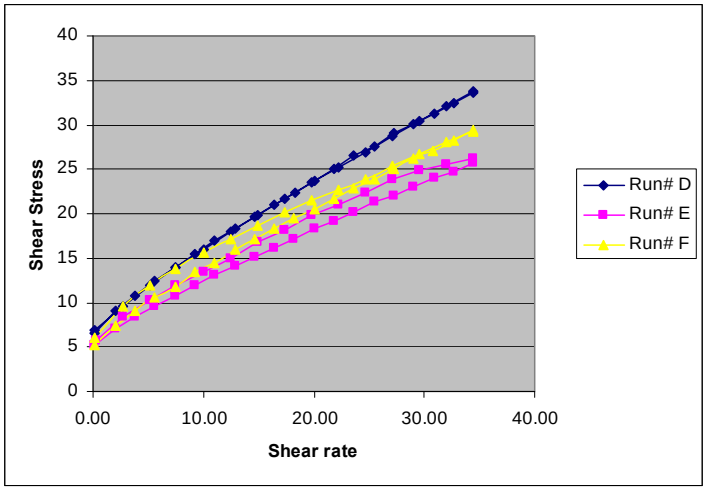
					Average	Stdev
YS	39.2		35.7	47.8	40.9	6.2
VS	7.3		6.7	9.1	7.7	1.2
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	367		302	466	378	83



Set C1: CS-BX3 – BL3- L1 – Mixing Day – NIST code (folder SR 45-SR-44B)

SR-44B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	6.916	0.21	5.697	0.20	6.112	0.20	6.24
2.65	9.652	2.65	8.415	2.65	9.636	2.65	9.23
5.09	11.98	5.10	10.27	5.09	11.85	5.09	11.37
7.52	13.9	7.52	11.92	7.52	13.75	7.52	13.19
10.00	15.95	10.00	13.41	10.00	15.55	10.00	14.97
12.41	17.91	12.41	15.01	12.41	17.1	12.41	16.67
14.90	19.85	14.90	16.83	14.90	18.7	14.90	18.46
17.31	21.66	17.38	18.19	17.31	20.15	17.33	20.00
19.79	23.52	19.79	19.78	19.79	21.47	19.79	21.59
22.21	25.17	22.21	21.03	22.21	22.62	22.21	22.94
24.69	26.85	24.69	22.41	24.69	23.94	24.69	24.40
27.10	28.72	27.17	23.9	27.10	25.39	27.13	26.00
29.59	30.36	29.59	24.81	29.59	26.68	29.59	27.28
32.00	32.16	32.00	25.58	32.00	28.03	32.00	28.59
34.48	33.75	34.48	26.22	34.48	29.22	34.48	29.73
34.48	33.68	34.48	25.7	34.48	29.33	34.48	29.57
32.69	32.44	32.69	24.73	32.69	28.26	32.69	28.48
30.90	31.26	30.90	24.05	30.83	27.13	30.87	27.48
29.03	30.03	29.03	23.08	29.03	26.2	29.03	26.44
27.24	29.03	27.24	22.01	27.24	25.05	27.24	25.36
25.45	27.51	25.45	21.28	25.45	23.82	25.45	24.20
23.66	26.48	23.66	20.19	23.66	22.87	23.66	23.18
21.86	25.02	21.86	19.24	21.86	21.76	21.86	22.01
20.00	23.66	20.07	18.29	20.00	20.49	20.02	20.81
18.28	22.32	18.21	17.1	18.21	19.47	18.23	19.63
16.41	20.95	16.41	16.06	16.41	18.33	16.41	18.45
14.62	19.73	14.62	15.21	14.62	17.08	14.62	17.34
12.83	18.38	12.83	14.13	12.83	16.02	12.83	16.18
11.03	17.04	11.03	13.19	11.03	14.46	11.03	14.90
9.24	15.5	9.24	11.95	9.24	13.38	9.24	13.61
7.45	13.95	7.45	10.81	7.45	11.76	7.45	12.17
5.61	12.42	5.60	9.577	5.60	10.51	5.60	10.84
3.81	10.76	3.82	8.329	3.81	9.135	3.81	9.41
2.00	9.064	2.01	7.108	1.99	7.369	2.00	7.85
0.20	6.615	0.19	5.181	0.20	5.263	0.20	5.69

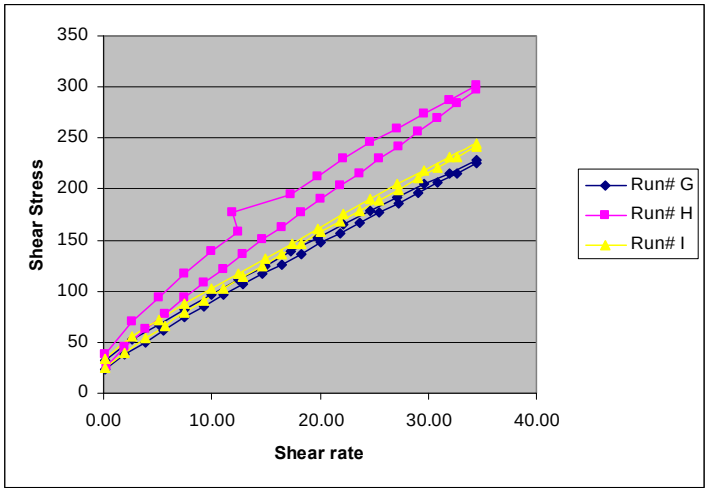
				Average	Stdev
YS	8.0	6.3	6.6	7.0	0.9
VS	0.8	0.6	0.7	0.7	0.1
R2	1.00	1.00	0.99	1.0	0.0
Hysteresis	4	25	39	23	17



Set C1: CS-BX3 – BL3- L2 – Mixing Day – NIST code (folder SR 45-SR-44C)

SR-44C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	32.36	0.21	38.7	0.21	33.18	0.20	34.75
2.65	52.56	2.65	70	2.64	55.08	2.65	59.21
5.10	68	5.10	93.33	5.10	71.75	5.10	77.69
7.52	82.35	7.52	117.5	7.52	87.37	7.52	95.74
10.00	96.75	10.00	138.8	10.00	101.8	10.00	112.45
12.41	111	12.41	158.2	12.41	116.6	12.41	128.60
14.90	124.8	11.93	176.9	14.90	131.8	13.91	144.50
17.31	139.1	17.31	195.1	17.38	146.6	17.33	160.27
19.79	152.6	19.79	212.4	19.79	161.8	19.79	175.60
22.21	166.2	22.21	230.1	22.21	176.3	22.21	190.87
24.69	179.3	24.69	246.3	24.69	190.7	24.69	205.43
27.10	191.6	27.10	259.9	27.10	204.5	27.10	218.67
29.59	204.5	29.59	274.5	29.59	218.1	29.59	232.37
32.00	215.8	32.00	287.3	32.00	231.1	32.00	244.73
34.48	227.9	34.48	301.3	34.48	243.9	34.48	257.70
34.48	225.2	34.48	297.2	34.48	242	34.48	254.80
32.69	215.1	32.69	283.4	32.69	230.7	32.69	243.07
30.83	206.7	30.83	269.5	30.90	221.1	30.85	232.43
29.03	196.7	29.03	256.8	29.03	210.5	29.03	221.33
27.24	186.4	27.24	242	27.24	199.4	27.24	209.27
25.45	177.2	25.45	230	25.45	189.6	25.45	198.93
23.66	166.7	23.66	215.9	23.66	178.5	23.66	187.03
21.86	157.3	21.86	204.1	21.86	168.5	21.86	176.63
20.07	147.6	20.00	190.4	20.07	158	20.05	165.33
18.28	136.5	18.28	176.6	18.21	146.5	18.25	153.20
16.41	126.4	16.41	163.1	16.41	135.7	16.41	141.73
14.62	117.1	14.62	150.5	14.62	125.1	14.62	130.90
12.83	106.4	12.83	136.7	12.83	113.8	12.83	118.97
11.03	96.04	11.03	122.2	11.03	102.7	11.03	106.98
9.24	84.85	9.24	108.3	9.24	90.84	9.24	94.66
7.45	73.97	7.45	93.53	7.45	79.11	7.45	82.20
5.60	62	5.61	78.19	5.61	66.29	5.61	68.83
3.81	50.1	3.82	62.55	3.81	53.48	3.81	55.38
1.99	37.4	1.99	45.68	2.01	39.84	2.00	40.97
0.20	22.91	0.21	26.82	0.20	24.18	0.20	24.64

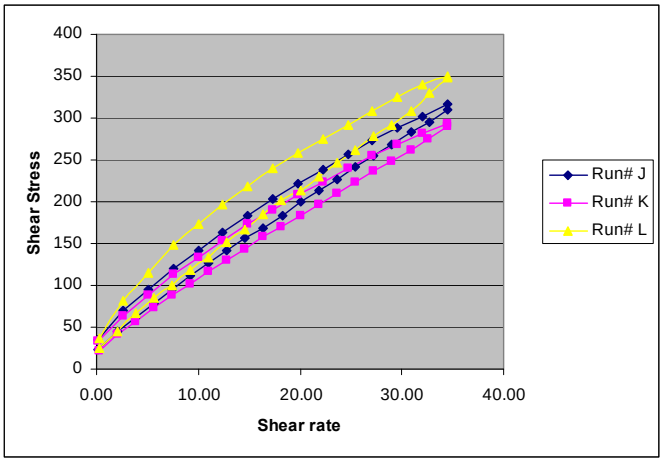
				Average	Stdev
YS	29.3	34.2	31.1	31.5	2.5
VS	5.8	7.7	6.2	6.6	1.0
R2	1.00	1.00	1.00	1.0	0.0
Hysteresis	142	597	142	294	262



Set C1: CS-BX3 – BL30- L2 – Mixing Day – NIST code (folder SR 45-SR-44D)

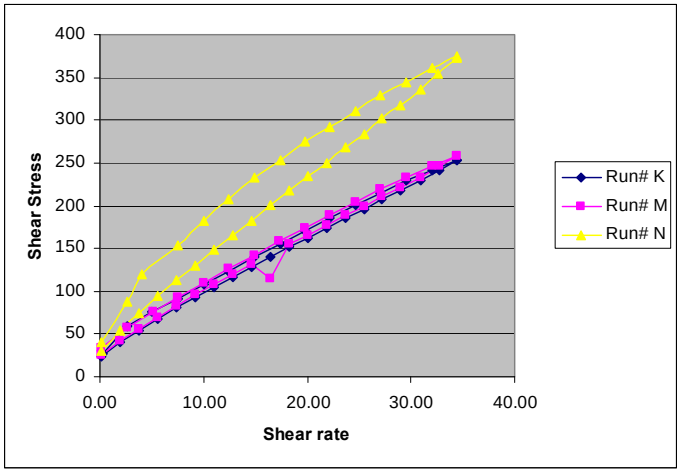
SR-44D							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	34.94	0.20	33.52	0.21	37.21	0.20	35.22
2.64	70.15	2.63	63.05	2.63	82.12	2.64	71.77
5.10	94.66	5.09	88.1	5.10	114.9	5.10	99.22
7.52	119.7	7.52	112.9	7.52	148.5	7.52	127.03
10.00	141.3	10.00	133.2	10.00	173	10.00	149.17
12.41	162.6	12.41	153.2	12.41	196.6	12.41	170.80
14.90	183.3	14.90	172.8	14.90	218	14.90	191.37
17.31	202.7	17.38	190.7	17.31	239.6	17.33	211.00
19.79	221.5	19.79	208.2	19.79	257.7	19.79	229.13
22.21	239	22.21	224	22.28	275	22.23	246.00
24.69	256	24.69	239.8	24.69	291.9	24.69	262.57
27.10	272.8	27.10	254.8	27.10	309.1	27.10	278.90
29.59	288.6	29.59	268.4	29.59	324.6	29.59	293.87
32.00	302.1	32.00	280.9	32.00	339.8	32.00	307.60
34.48	316.7	34.48	293.4	34.48	349.8	34.48	319.97
34.48	310.4	34.48	289.4	34.48	347.9	34.48	315.90
32.69	295.5	32.62	275	32.69	330.3	32.67	300.27
30.90	283.7	30.90	262.2	30.90	309.1	30.90	285.00
29.03	268.7	29.03	248.1	29.03	292.4	29.03	269.73
27.24	255.5	27.24	236.6	27.24	279.1	27.24	257.07
25.45	241.6	25.45	223.1	25.45	260.9	25.45	241.87
23.66	227.5	23.66	210.6	23.66	246.7	23.66	228.27
21.86	213	21.86	196.4	21.86	230	21.86	213.13
20.07	199.5	20.07	184	20.07	214	20.07	199.17
18.28	183	18.21	170.4	18.21	201.4	18.23	184.93
16.41	168.7	16.41	157.6	16.41	185.1	16.41	170.47
14.62	156.3	14.62	143.9	14.62	166.9	14.62	155.70
12.83	141	12.83	129.7	12.83	151.8	12.83	140.83
11.03	126.4	11.03	117.1	11.03	134.1	11.03	125.87
9.24	110.9	9.24	102	9.24	118.5	9.24	110.47
7.38	95.55	7.45	88.3	7.45	100.5	7.43	94.78
5.60	78.47	5.61	73.01	5.61	84.18	5.61	78.55
3.81	62.02	3.81	57.29	3.82	65.84	3.81	61.72
2.00	44.4	2.02	41.42	2.01	45.78	2.01	43.87
0.20	23.98	0.21	22.5	0.21	24.26	0.21	23.58

					Average	Stdev
YS	32.3		29.6	30.9	30.9	1.4
VS	8.2		7.6	9.1	8.3	0.8
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	481		572	1184	746	382



Set C3: CS-BX3 – BL30- L1 – 3 day – NIST code (folder SR 46-SR-44A)

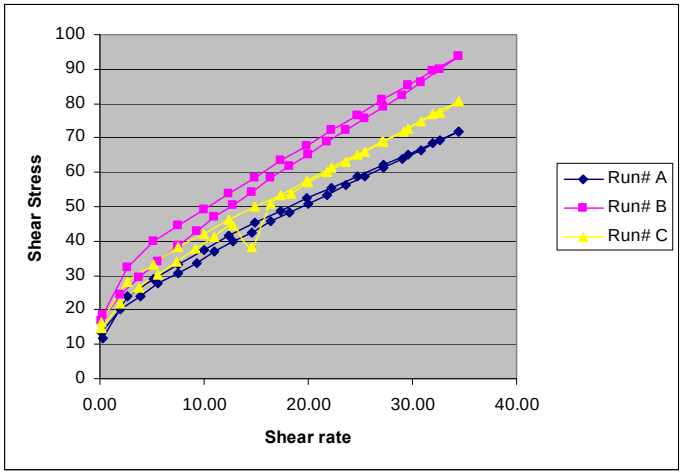
SR-44A							
Run# K		Run# M		Run# N		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	26.45	0.20	32.94	0.20	40.73	0.23	33.37
2.65	58.31	2.64	57.33	2.65	87.18	2.65	67.61
5.08	75.69	5.10	75.47	4.06	120	4.75	90.39
7.59	91.88	7.52	92.52	7.59	154.4	7.56	112.93
10.00	108.1	10.00	109.2	10.00	182.6	10.00	133.30
12.41	124	12.41	125.8	12.41	207.9	12.41	152.57
14.90	139.4	14.90	142.4	14.90	232.2	14.90	171.33
17.38	155.7	17.31	158.2	17.38	253.7	17.36	189.20
19.79	170.4	19.79	174.1	19.79	274.4	19.79	206.30
22.21	185.7	22.21	189.1	22.21	292.6	22.21	222.47
24.69	200.1	24.69	203.9	24.69	310.2	24.69	238.07
27.10	214.2	27.10	219.2	27.10	328.8	27.10	254.07
29.59	228.8	29.59	232.6	29.59	344.4	29.59	268.60
32.00	242	32.00	246.5	32.00	361.1	32.00	283.20
34.48	253.8	34.48	258.3	34.48	375.3	34.48	295.80
34.48	253.6	34.48	258.3	34.48	372.2	34.48	294.70
32.69	241.7	32.69	246.4	32.62	353.9	32.67	280.67
30.90	228.9	30.90	233.1	30.90	335.4	30.90	265.80
29.03	217.5	29.03	221.8	29.03	317.5	29.03	252.27
27.24	207.4	27.24	211.5	27.24	301.9	27.24	240.27
25.45	195.5	25.45	199.4	25.45	284.2	25.45	226.37
23.66	185.1	23.66	188.8	23.66	268.3	23.66	214.07
21.86	173.2	21.86	177.3	21.86	250.6	21.86	200.37
20.07	162.1	20.07	165.7	20.07	234.1	20.07	187.30
18.21	151.8	18.21	155.4	18.21	218.2	18.21	175.13
16.41	140.5	16.41	115.1	16.41	201.4	16.41	152.33
14.62	127.9	14.62	131.3	14.62	183	14.62	147.40
12.83	116.3	12.83	120	12.83	165.9	12.83	134.07
11.03	104.9	11.03	107.2	11.03	148.6	11.03	120.23
9.24	92.48	9.24	95.57	9.24	130.4	9.24	106.15
7.45	80.3	7.38	82.27	7.45	112.4	7.43	91.66
5.61	67.88	5.60	69.87	5.61	93.75	5.61	77.17
3.81	54.53	3.81	56.39	3.81	73.99	3.81	61.64
2.01	40.59	2.01	41.5	2.01	53.57	2.01	45.22
0.21	24.33	0.20	24.72	0.20	30.46	0.20	26.50
						Average	Stdev
YS	30.4		30.2		37.8	32.8	4.3
VS	6.5		6.6		9.7	7.6	1.8
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	295		339		1059	564	429



Set C3: CS-BX3 – BL3- L1 – 3 day – NIST code (folder SR 46-SR-44B)

SR-44B							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.26	11.93	0.21	18.54	0.21	16.43	0.23	15.63
2.63	23.96	2.65	32.42	2.65	27.97	2.64	28.12
5.10	28.86	5.10	39.83	5.10	33.2	5.10	33.96
7.52	33	7.52	44.58	7.52	38.11	7.52	38.56
10.00	37.5	10.00	49.25	10.00	42.2	10.00	42.98
12.41	41.62	12.41	53.83	12.41	46.07	12.41	47.17
14.90	45.43	14.90	58.5	14.90	49.98	14.90	51.30
17.31	48.93	17.31	63.33	17.31	53.51	17.31	55.26
19.79	52.38	19.79	67.84	19.79	57.45	19.79	59.22
22.21	55.65	22.21	72.19	22.21	61.16	22.21	63.00
24.69	58.93	24.69	76.6	24.69	65.04	24.69	66.86
27.17	62.06	27.10	81.1	27.10	69.02	27.13	70.73
29.59	65.31	29.59	85.39	29.59	72.75	29.59	74.48
32.00	68.63	32.00	89.66	32.00	76.8	32.00	78.36
34.48	71.89	34.48	93.77	34.48	80.78	34.48	82.15
34.48	71.83	34.48	93.58	34.48	80.47	34.48	81.96
32.69	69.2	32.69	89.76	32.69	77.43	32.69	78.80
30.83	66.46	30.83	86.01	30.83	74.61	30.83	75.69
29.03	63.71	29.03	82.51	29.10	71.77	29.06	72.66
27.24	61.38	27.24	79.19	27.24	68.8	27.24	69.79
25.45	58.69	25.45	75.61	25.45	65.81	25.45	66.70
23.66	56.23	23.66	72.3	23.66	62.95	23.66	63.83
21.86	53.35	21.86	68.73	21.86	60.01	21.86	60.70
20.07	50.87	20.07	65.22	20.07	56.96	20.07	57.68
18.21	48.37	18.21	61.84	18.28	53.78	18.23	54.66
16.41	45.64	16.41	58.26	16.41	50.7	16.41	51.53
14.62	42.51	14.62	54.39	14.62	38.29	14.62	45.06
12.83	39.8	12.83	50.59	12.83	44.62	12.83	45.00
11.03	36.99	11.03	46.89	11.03	41.25	11.03	41.71
9.24	33.82	9.24	42.77	9.17	37.84	9.22	38.14
7.45	30.64	7.45	38.71	7.38	34.08	7.43	34.48
5.60	27.66	5.60	34.18	5.59	30.28	5.60	30.71
3.82	24.11	3.81	29.5	3.81	26.31	3.81	26.64
2.01	20.08	2.00	24.54	1.99	21.93	2.00	22.18
0.21	13.56	0.20	16.65	0.21	14.85	0.20	15.02

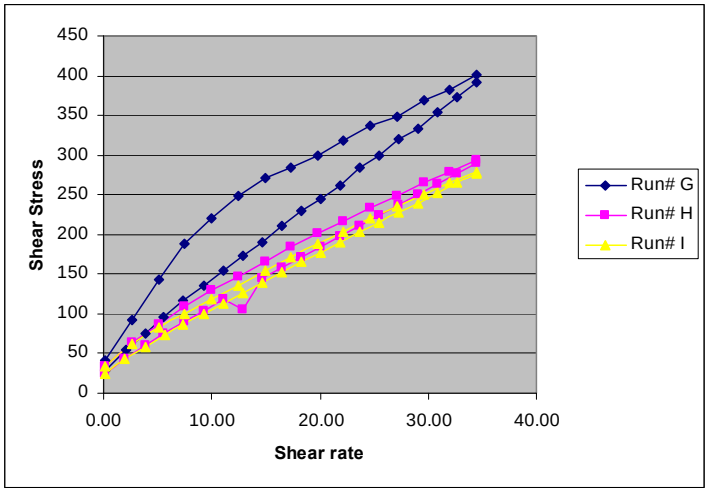
					Average	Stdev
YS	18.0		21.8	19.0	19.6	1.9
VS	1.6		2.1	1.8	1.8	0.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	50		111	65	75	32.1



Set C3: CS-BX3 – BL3- L2 – 3 day – NIST code (folder SR 46-SR-44C)

SR-44C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	41.75	0.20	33.85	0.21	33.67	0.20	36.42
2.63	92.66	2.65	64.25	2.64	62.01	2.64	72.97
5.10	142.9	5.10	86.09	5.10	82.4	5.10	103.80
7.52	187.5	7.52	108.5	7.52	100.2	7.52	132.07
10.00	219.7	10.00	129	10.00	118.2	10.00	155.63
12.41	248.5	12.41	147.5	12.41	136.1	12.41	177.37
14.90	271.1	14.90	165.7	14.90	153.7	14.90	196.83
17.31	283.9	17.31	183.6	17.31	170.7	17.31	212.73
19.79	299	19.79	200.7	19.79	187.9	19.79	229.20
22.21	318.5	22.21	217	22.21	204	22.21	246.50
24.69	336.1	24.69	233.2	24.69	220.1	24.69	263.13
27.10	348.7	27.10	249.4	27.17	235.1	27.13	277.73
29.59	368.5	29.59	265	29.59	250.2	29.59	294.57
32.00	381.4	32.00	279.5	32.00	264.8	32.00	308.57
34.48	401.4	34.48	292.9	34.48	279.3	34.48	324.53
34.48	392	34.48	290.4	34.48	277.4	34.48	319.93
32.69	372.6	32.69	276.2	32.69	264.6	32.69	304.47
30.90	354.3	30.90	263.1	30.83	252.2	30.87	289.87
29.03	333.8	29.10	249.8	29.03	239.7	29.06	274.43
27.24	320.7	27.24	237.8	27.24	227.8	27.24	262.10
25.45	299.3	25.45	224.1	25.45	214.9	25.45	246.10
23.66	284.3	23.66	211.5	23.66	202.8	23.66	232.87
21.86	262.6	21.86	198	21.86	189.9	21.86	216.83
20.07	245.5	20.07	184.9	20.07	177.4	20.07	202.60
18.21	229.5	18.21	171.3	18.28	165.1	18.23	188.63
16.41	211.5	16.41	158.1	16.41	152.3	16.41	173.97
14.62	191.1	14.62	145	14.62	139.4	14.62	158.50
12.83	173	12.83	105.1	12.83	126.7	12.83	134.93
11.03	155.1	11.03	118	11.03	113.5	11.03	128.87
9.24	135.5	9.24	103.7	9.24	100.2	9.24	113.13
7.38	116.1	7.45	89.51	7.38	86.29	7.40	97.30
5.60	96.62	5.59	74.78	5.61	72.49	5.60	81.30
3.81	75.96	3.81	59.73	3.82	58.14	3.82	64.61
2.02	54.13	1.99	43.49	2.01	42.44	2.01	46.69
0.20	28.97	0.20	25.25	0.20	24.76	0.20	26.33

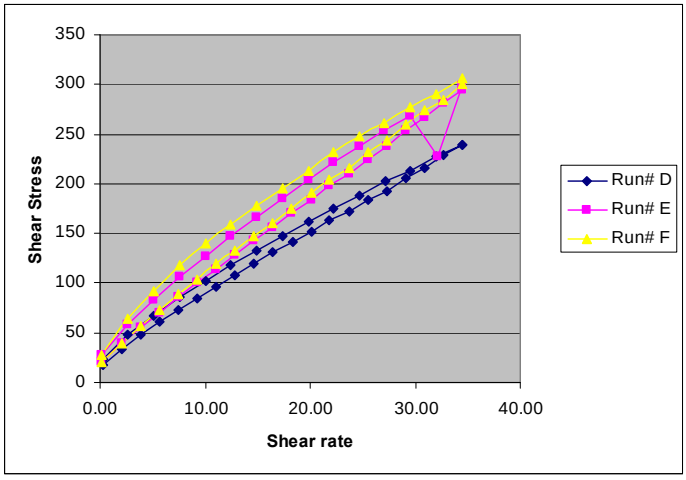
					Average	Stdev
YS	37.3		29.4	31.2	32.6	4.1
VS	10.3		7.6	7.2	8.4	1.7
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	1349		477	297	708	563



Set C3: CS-BX3 – BL30- L2 – 3 day – NIST code (folder SR 46-SR-44D)

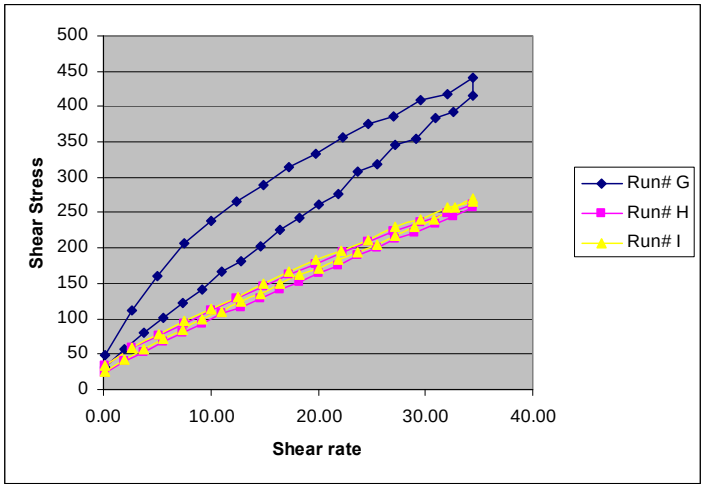
SR-44D							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	23.22	0.20	27.58	0.19	28.18	0.20	26.33
2.64	47.56	2.65	58.5	2.64	64.12	2.64	56.73
5.10	67.39	5.08	82.8	5.08	91.87	5.09	80.69
7.52	85.44	7.52	105.8	7.52	118.2	7.52	103.15
10.00	102.6	10.00	127.5	10.00	139.4	10.00	123.17
12.41	117.7	12.41	147.6	12.41	159	12.41	141.43
14.90	132.9	14.90	166.9	14.90	177.7	14.90	159.17
17.31	147.3	17.38	185.7	17.38	195.8	17.36	176.27
19.79	162	19.79	203.6	19.79	212.9	19.79	192.83
22.21	174.3	22.21	221.4	22.21	231.2	22.21	208.97
24.69	187.9	24.69	238.2	24.69	247.6	24.69	224.57
27.17	202.8	27.10	253.5	27.10	261.4	27.13	239.23
29.59	213.4	29.59	268.6	29.59	276.8	29.59	252.93
32.00	228.2	32.07	226.9	32.00	290.1	32.02	248.40
34.48	239.4	34.48	299	34.48	306.9	34.48	281.77
34.48	239.6	34.48	295.1	34.48	300.2	34.48	278.30
32.69	228.4	32.69	280.9	32.69	285.1	32.69	264.80
30.83	215.4	30.83	266.8	30.90	274.2	30.85	252.13
29.03	206.2	29.03	253.9	29.03	259.5	29.03	239.87
27.24	192.9	27.24	237.8	27.24	244.2	27.24	224.97
25.45	183.4	25.45	224.9	25.45	232.2	25.45	213.50
23.66	171.7	23.66	210.3	23.66	216.5	23.66	199.50
21.86	163.5	21.86	198.4	21.86	204.2	21.86	188.70
20.07	151.6	20.07	184	20.07	190.5	20.07	175.37
18.28	142	18.21	169.9	18.21	174.3	18.23	162.07
16.41	130.8	16.41	156	16.41	160.2	16.41	149.00
14.62	119.3	14.62	142.9	14.62	147.9	14.62	136.70
12.83	108.6	12.83	128.7	12.83	133	12.83	123.43
11.03	95.58	11.03	113.9	11.03	119.2	11.03	109.56
9.24	85.25	9.24	100.3	9.24	103.8	9.24	96.45
7.45	72.43	7.45	85.55	7.45	89.04	7.45	82.34
5.61	60.55	5.61	70.59	5.61	72.44	5.61	67.86
3.81	47.72	3.81	55.25	3.81	56.48	3.81	53.15
2.01	33.54	2.01	38.94	2.01	39.94	2.01	37.47
0.21	18.17	0.20	20.6	0.20	20.69	0.20	19.82

					Average	Stdev
YS	24.5		25.5	27.3	25.8	1.4
VS	6.3		7.9	8.0	7.4	1.0
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	328		313	512	385	111



Set C7: CS-BX3 – BL30- L1 – 7 day – NIST code (folder SR 47-SR-44A)

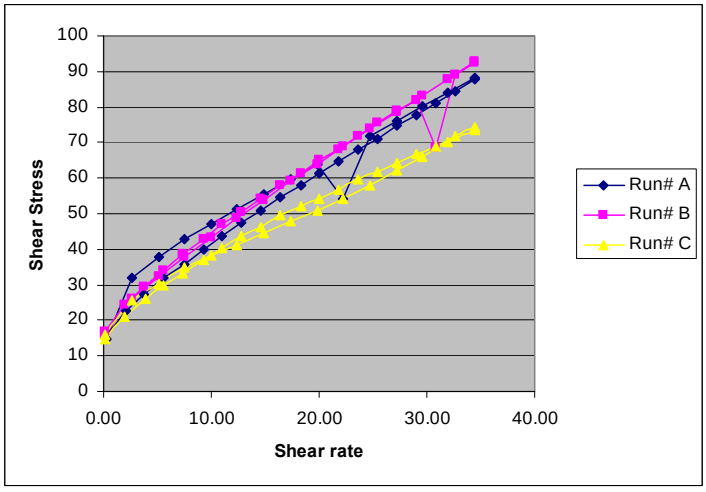
SR-44A							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	49.15	0.19	33.64	0.21	33.31	0.20	38.70
2.64	111.9	2.64	58.53	2.65	58.15	2.64	76.19
5.08	160	5.10	76.71	5.10	78.96	5.09	105.22
7.52	206.7	7.52	93.84	7.52	96.77	7.52	132.44
10.00	237.5	10.00	111.1	10.00	113.8	10.00	154.13
12.41	266.7	12.41	128.3	12.48	131	12.44	175.33
14.90	288.6	14.90	144.8	14.90	149.4	14.90	194.27
17.31	315	17.31	161.9	17.31	166.2	17.31	214.37
19.79	333.3	19.79	177.9	19.79	183.4	19.79	231.53
22.28	357.5	22.28	193.4	22.21	196.5	22.25	249.13
24.69	376	24.69	208.4	24.69	211.3	24.69	265.23
27.10	385.8	27.10	222.7	27.17	229.9	27.13	279.47
29.59	410.1	29.59	237.1	29.59	241.5	29.59	296.23
32.00	416.8	32.00	249.1	32.00	257.5	32.00	307.80
34.48	440.2	34.48	261.1	34.48	266	34.48	322.43
34.41	415.6	34.48	257.4	34.48	269.7	34.46	314.23
32.62	393.1	32.62	244.4	32.69	258	32.64	298.50
30.90	383.5	30.90	234.5	30.83	240.3	30.87	286.10
29.10	354.7	29.03	221.3	29.03	230	29.06	268.67
27.24	346.8	27.24	212.1	27.24	217.5	27.24	258.80
25.45	318.5	25.45	199.8	25.45	204.8	25.45	241.03
23.66	307.1	23.66	189.2	23.66	194.1	23.66	230.13
21.86	276.9	21.86	175.4	21.86	183.2	21.86	211.83
20.07	261.4	20.07	165.1	20.07	170.2	20.07	198.90
18.21	243.3	18.21	152.9	18.21	162.3	18.21	186.17
16.41	225.2	16.41	141.7	16.41	149.9	16.41	172.27
14.62	202	14.62	129.6	14.62	135.1	14.62	155.57
12.83	181.1	12.83	116.8	12.83	124.7	12.83	140.87
11.03	165.9	11.03	106.7	11.03	109.7	11.03	127.43
9.24	142	9.24	92.65	9.24	98.83	9.24	111.16
7.45	123.3	7.45	81.02	7.45	84.03	7.45	96.12
5.60	102	5.61	67.38	5.60	72.17	5.60	80.52
3.79	79.64	3.81	53.54	3.82	57.99	3.81	63.72
2.01	57.57	2.01	40.3	2.01	41.66	2.01	46.51
0.20	31.12	0.21	24.09	0.20	25.08	0.20	26.76
						Average	Stdev
YS	38.5		29.5		31.9	33.3	4.7
VS	11.1		6.7		6.9	8.2	2.5
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	1301		298		470	690	536



Set C7: CS-BX3 – BL3- L1 – 7 day – NIST code (folder SR 47-SR-44B)

SR-44B							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	14.89	0.21	16.07	0.20	16.15	0.23	15.70
2.65	32.13	2.63	26.05	2.64	25.53	2.64	27.90
5.10	38.02	5.10	32.27	5.10	30.37	5.10	33.55
7.52	42.75	7.52	38.01	7.52	34.68	7.52	38.48
10.00	46.95	10.00	43.27	10.00	38.16	10.00	42.79
12.41	51.24	12.41	48.57	12.41	41.36	12.41	47.06
14.90	55.28	14.90	53.98	14.90	44.58	14.90	51.28
17.31	59.68	17.38	59.08	17.31	47.92	17.33	55.56
19.79	63.66	19.79	64.04	19.79	51.01	19.79	59.57
22.21	54.33	22.28	68.98	22.21	54.39	22.23	59.23
24.69	71.93	24.69	73.84	24.69	58.11	24.69	67.96
27.17	75.96	27.17	78.55	27.17	62.27	27.17	72.26
29.59	80.38	29.59	83.23	29.59	65.77	29.59	76.46
32.00	84.12	32.00	87.81	32.00	69.97	32.00	80.63
34.48	88.19	34.48	92.87	34.48	73.41	34.48	84.82
34.48	87.81	34.48	92.52	34.48	74.32	34.48	84.88
32.69	84.38	32.69	88.96	32.69	72.03	32.69	81.79
30.83	81.08	30.83	68.65	30.83	68.98	30.83	72.90
29.03	77.75	29.03	82.08	29.03	66.62	29.03	75.48
27.24	74.63	27.24	78.79	27.24	64.42	27.24	72.61
25.45	71.1	25.45	75.45	25.45	61.84	25.45	69.46
23.66	68	23.66	71.86	23.66	59.58	23.66	66.48
21.86	64.64	21.86	68.26	21.86	56.85	21.86	63.25
20.07	61.17	20.07	64.96	20.07	54.39	20.07	60.17
18.28	57.93	18.28	61.44	18.28	52.18	18.28	57.18
16.41	54.53	16.41	57.85	16.41	49.38	16.41	53.92
14.62	50.96	14.62	54.09	14.62	46.18	14.62	50.41
12.83	47.36	12.83	50.53	12.83	43.52	12.83	47.14
11.03	43.5	11.03	46.89	11.03	40.15	11.03	43.51
9.24	40.01	9.24	42.73	9.24	37.08	9.24	39.94
7.45	35.87	7.38	38.62	7.38	33.22	7.40	35.90
5.61	31.76	5.61	34.2	5.61	29.91	5.61	31.96
3.81	27.4	3.81	29.58	3.82	25.9	3.82	27.63
2.02	22.56	2.01	24.56	2.00	21.14	2.01	22.75
0.20	15.19	0.21	16.66	0.20	14.58	0.20	15.48

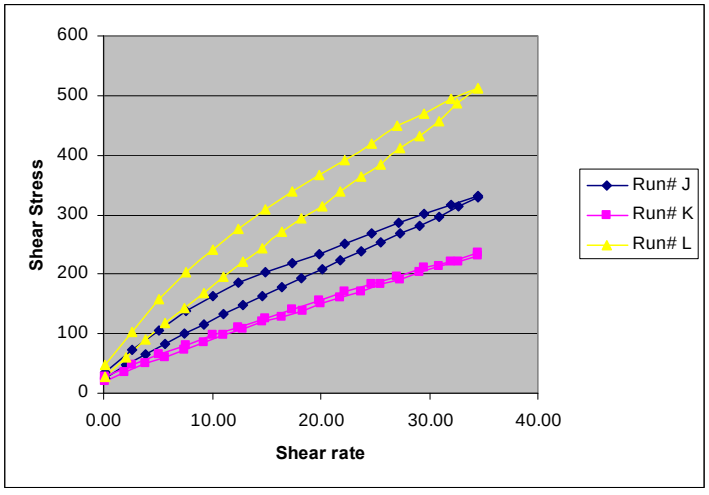
					Average	Stdev
YS	19.9		22.9		20.3	21.0	1.6
VS	2.0		2.0		1.6	1.9	0.2
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	76		3		5	28	42



Set C7: CS-BX3 – BL3- L2 – 7 day – NIST code (folder SR 47-SR-44C)

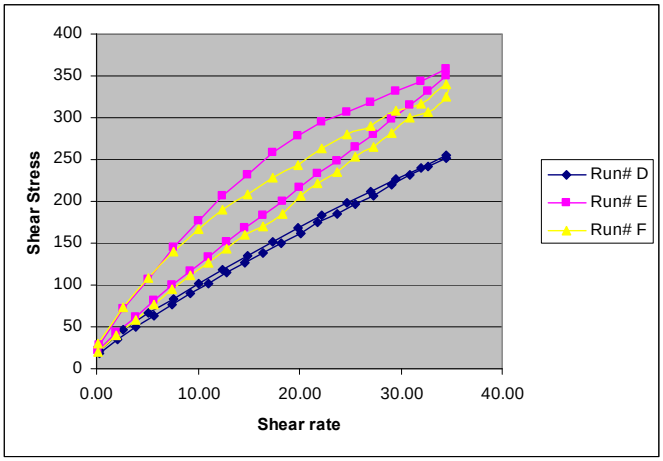
SR-44C							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	34.26	0.20	27.14	0.20	47.65	0.20	36.35
2.63	73.36	2.65	48.71	2.66	103.7	2.65	75.26
5.10	105.5	5.10	65.51	5.09	159.2	5.09	110.07
7.52	139.2	7.52	81.33	7.59	204.6	7.54	141.71
10.00	163.1	10.00	96.67	10.00	241.1	10.00	166.96
12.41	186.3	12.41	111.7	12.41	277.1	12.41	191.70
14.90	204.2	14.90	126	14.90	309.8	14.90	213.33
17.38	218.3	17.31	141.5	17.38	340.1	17.36	233.30
19.79	234.6	19.79	154.8	19.79	366	19.79	251.80
22.21	252.2	22.21	170.2	22.21	392	22.21	271.47
24.69	269.2	24.69	184.1	24.69	418.5	24.69	290.60
27.17	285.3	27.10	196	27.10	448.4	27.13	309.90
29.59	302.3	29.59	210.7	29.59	469.8	29.59	327.60
32.00	317.1	32.00	221.5	32.00	494.5	32.00	344.37
34.48	332.1	34.48	236.1	34.48	511.4	34.48	359.87
34.48	328.7	34.48	230.7	34.48	512.4	34.48	357.27
32.69	313	32.69	219.9	32.62	487.5	32.67	340.13
30.90	297.3	30.90	213.4	30.90	457.2	30.90	322.63
29.03	282	29.10	202.7	29.03	432.2	29.06	305.63
27.24	269.2	27.24	191.3	27.24	411	27.24	290.50
25.45	252.8	25.45	182.4	25.45	384.9	25.45	273.37
23.66	239.3	23.66	170.6	23.66	364.1	23.66	258.00
21.86	222.9	21.86	161.5	21.86	338.4	21.86	240.93
20.07	208.4	20.00	151.2	20.07	314.2	20.05	224.60
18.21	194.5	18.28	138	18.21	294.5	18.23	209.00
16.41	179.4	16.41	127.6	16.41	270.6	16.41	192.53
14.62	162.9	14.62	119.4	14.62	243.1	14.62	175.13
12.83	147.7	12.83	108	12.83	219.8	12.83	158.50
11.03	132.2	11.03	96.74	11.03	195.5	11.03	141.48
9.24	116.1	9.24	85.62	9.24	169.4	9.24	123.71
7.45	99.45	7.45	73.89	7.45	143.9	7.45	105.75
5.61	82.92	5.61	61.27	5.61	118.5	5.61	87.56
3.82	65.32	3.81	49.16	3.80	90.32	3.81	68.27
2.01	46.6	1.99	35.94	2.02	60.98	2.01	47.84
0.20	25.46	0.20	21.21	0.19	28.25	0.20	24.97

				Average	Stdev
YS	33.4	27.5	38.8	33.3	5.7
VS	8.6	6.0	13.7	9.5	3.9
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	772	30	1558	787	764



Set C7: CS-BX3 – BL30- L2 – 7 day – NIST code (folder SR 47-SR-44D)

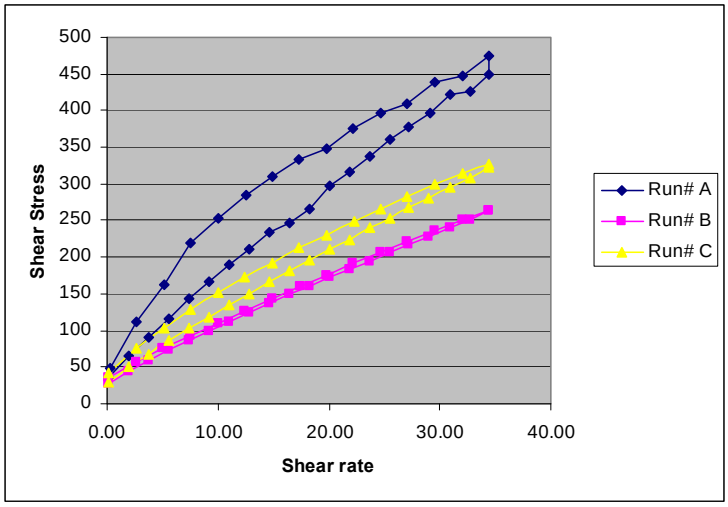
SR-44D							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	21.88	0.21	28.07	0.20	30.64	0.21	26.86
2.65	46.86	2.66	71.07	2.65	73.76	2.65	63.90
5.08	66.15	5.10	107.4	5.10	108	5.09	93.85
7.59	83.98	7.52	144.5	7.52	140.8	7.54	123.09
10.00	101.1	10.00	177.1	10.00	166.2	10.00	148.13
12.41	118.3	12.41	207	12.41	189.8	12.41	171.70
14.90	134.9	14.90	232.5	14.90	208.9	14.90	192.10
17.38	151.9	17.31	257.9	17.31	228.4	17.33	212.73
19.79	167.6	19.79	278.2	19.79	242.9	19.79	229.57
22.21	183.8	22.21	294.7	22.21	264	22.21	247.50
24.69	198.8	24.69	307.1	24.69	280.7	24.69	262.20
27.10	212	27.10	318.3	27.10	289.5	27.10	273.27
29.59	227.2	29.59	331.9	29.59	308.6	29.59	289.23
32.00	240	32.00	343.5	32.00	316.9	32.00	300.13
34.48	255.4	34.48	358	34.48	339.7	34.48	317.70
34.48	252.4	34.48	350	34.48	324.3	34.48	308.90
32.69	241	32.69	331.5	32.69	306.8	32.69	293.10
30.90	231.6	30.83	315.2	30.90	300.2	30.87	282.33
29.03	219.7	29.03	298.7	29.10	282.3	29.06	266.90
27.24	207.5	27.24	279.9	27.24	265.6	27.24	251.00
25.45	197.3	25.45	265.4	25.45	253.2	25.45	238.63
23.66	184.7	23.66	247.7	23.66	234.6	23.66	222.33
21.86	174.2	21.86	233.6	21.86	221.1	21.86	209.63
20.07	162.5	20.00	216.7	20.07	206.7	20.05	195.30
18.21	149.6	18.28	200.1	18.28	185.4	18.25	178.37
16.41	137.9	16.41	183.6	16.41	170.2	16.41	163.90
14.62	126.8	14.62	167.9	14.62	160	14.62	151.57
12.83	114.4	12.83	151.2	12.83	142.7	12.83	136.10
11.03	101.9	11.03	133.9	11.03	127.4	11.03	121.07
9.24	89.4	9.24	117	9.24	111	9.24	105.80
7.45	76.66	7.45	99.36	7.45	94.9	7.45	90.31
5.61	63.02	5.61	81.08	5.60	75.95	5.61	73.35
3.81	49.35	3.81	62.41	3.81	58.98	3.81	56.91
2.01	34.92	1.99	42.63	1.99	40.82	2.00	39.46
0.21	18.14	0.20	20.94	0.20	20.51	0.20	19.86
						Average	Stdev
YS	25.0		27.5		27.0	26.5	1.3
VS	6.7		9.4		8.8	8.3	1.4
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	101		1198		675	658	549



Set D1: CS-BX5 – BL11- L2 – Mixing Day – NIST code (folder SR 49-SR-48A)

SR-48A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	49.19	0.20	35.38	0.21	42.46	0.21	42.34
2.65	111.4	2.66	57.63	2.64	75.44	2.65	81.49
5.10	161.8	5.08	75.93	5.10	102.6	5.09	113.44
7.52	219.3	7.52	93.73	7.52	129.4	7.52	147.48
10.00	253.7	10.00	110.5	10.00	152.1	10.00	172.10
12.48	284.8	12.41	127.1	12.41	173.3	12.44	195.07
14.90	310.6	14.90	143.9	14.90	192.9	14.90	215.80
17.31	333.9	17.38	160	17.31	212.8	17.33	235.57
19.79	348.7	19.79	175.8	19.79	230.8	19.79	251.77
22.21	374.8	22.21	191	22.28	249.7	22.23	271.83
24.69	396.2	24.69	206.2	24.69	266.6	24.69	289.67
27.10	410	27.10	221.5	27.10	283.1	27.10	304.87
29.59	439.2	29.59	236	29.59	299.9	29.59	325.03
32.00	447.1	32.07	250.5	32.00	313.8	32.02	337.13
34.48	474	34.48	263.9	34.48	328	34.48	355.30
34.48	449	34.48	263.2	34.48	323.3	34.48	345.17
32.69	427	32.69	251.8	32.69	308	32.69	328.93
30.90	422.6	30.90	239.9	30.90	296.4	30.90	319.63
29.10	397.1	29.03	228.8	29.03	280.2	29.06	302.03
27.24	377.6	27.24	217.6	27.24	268.7	27.24	287.97
25.45	359.8	25.45	206.3	25.45	253.5	25.45	273.20
23.66	336.7	23.66	195.1	23.66	240.3	23.66	257.37
21.86	315.6	21.86	183.6	21.86	223.3	21.86	240.83
20.07	298	20.07	172.2	20.07	210.3	20.07	226.83
18.21	265.8	18.21	160.8	18.28	195.2	18.23	207.27
16.41	245.9	16.41	149.1	16.41	180.5	16.41	191.83
14.62	234.4	14.62	136.5	14.62	165.7	14.62	178.87
12.83	210.2	12.83	124.6	12.83	149.5	12.83	161.43
11.03	189.8	11.03	112.2	11.03	136	11.03	146.00
9.24	166	9.24	99.42	9.24	118.5	9.24	127.97
7.38	143.8	7.45	86.32	7.45	103.1	7.43	111.07
5.61	115.8	5.62	73.06	5.60	85.58	5.61	91.48
3.81	91.67	3.80	58.84	3.82	68.27	3.81	72.93
1.99	65.04	2.01	43.66	2.02	50.01	2.01	52.90
0.20	35.54	0.20	26.7	0.19	29.1	0.20	30.45

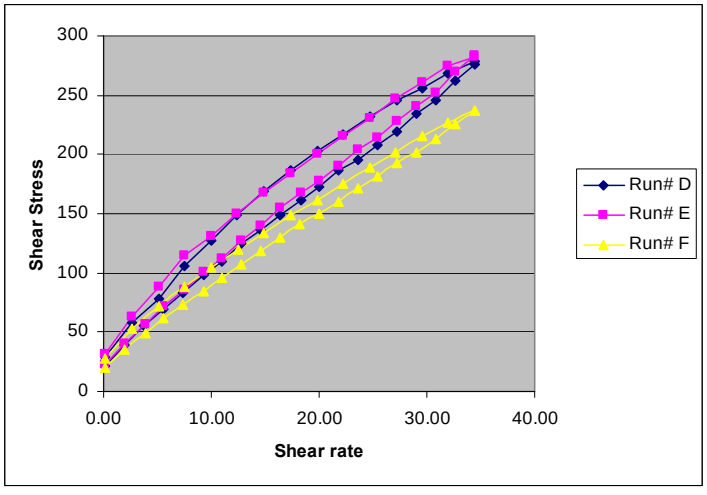
					Average	Stdev
YS	50.0		34.6	38.2	40.9	8.1
VS	12.0		6.7	8.4	9.0	2.7
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	946		156	529	544	395



Set D1: CS-BX5 – BL36- L1 – Mixing Day – NIST code (folder SR 49-SR-48B)

SR-48B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	29.36	0.20	32.12	0.19	27.99	0.20	29.82
2.63	57.83	2.64	63.62	2.63	53.53	2.64	58.33
5.10	78.62	5.10	88.3	5.10	71.41	5.10	79.44
7.52	105.6	7.52	114.8	7.52	87.86	7.52	102.75
10.00	127.7	10.00	131.7	10.00	104.3	10.00	121.23
12.41	148.9	12.41	149.4	12.48	119.3	12.44	139.20
14.90	169.1	14.90	167.5	14.90	133.4	14.90	156.67
17.31	186.9	17.31	184.5	17.31	148.5	17.31	173.30
19.79	203.5	19.79	200.8	19.79	161.9	19.79	188.73
22.21	217.3	22.28	215.8	22.28	175.5	22.25	202.87
24.69	231.4	24.69	230.8	24.69	188.6	24.69	216.93
27.17	246.3	27.10	247.4	27.10	202	27.13	231.90
29.59	256.5	29.59	260.7	29.59	215	29.59	244.07
32.00	268.8	32.00	274.3	32.00	227.2	32.00	256.77
34.48	278	34.48	282.9	34.48	236.9	34.48	265.93
34.48	276.5	34.48	284.1	34.48	236.4	34.48	265.67
32.69	262.3	32.69	270.2	32.69	225.2	32.69	252.57
30.83	245.6	30.90	252.1	30.90	212.8	30.87	236.83
29.03	234.6	29.03	240.3	29.03	202	29.03	225.63
27.24	219.4	27.24	228.5	27.24	193.2	27.24	213.70
25.45	208.1	25.45	214.6	25.45	181.4	25.45	201.37
23.66	195	23.66	203.6	23.66	172	23.66	190.20
21.86	186	21.86	190.8	21.86	160.4	21.86	179.07
20.07	172.7	20.07	177.4	20.07	150.1	20.07	166.73
18.28	161.5	18.28	167.5	18.21	141.1	18.25	156.70
16.41	149	16.41	154.5	16.41	130.4	16.41	144.63
14.62	136.6	14.62	139.8	14.62	118.1	14.62	131.50
12.83	124.2	12.83	127.6	12.83	107.4	12.83	119.73
11.03	109.3	11.03	112.7	11.03	95.84	11.03	105.95
9.24	97.99	9.24	100.5	9.24	84.92	9.24	94.47
7.38	83.36	7.45	85.53	7.38	72.89	7.40	80.59
5.61	69.92	5.60	72.23	5.61	61.54	5.60	67.90
3.81	55.4	3.82	57.08	3.82	48.94	3.82	53.81
2.01	38.99	2.01	40.19	2.01	35.02	2.01	38.07
0.20	21.58	0.19	22.29	0.20	20.12	0.20	21.33

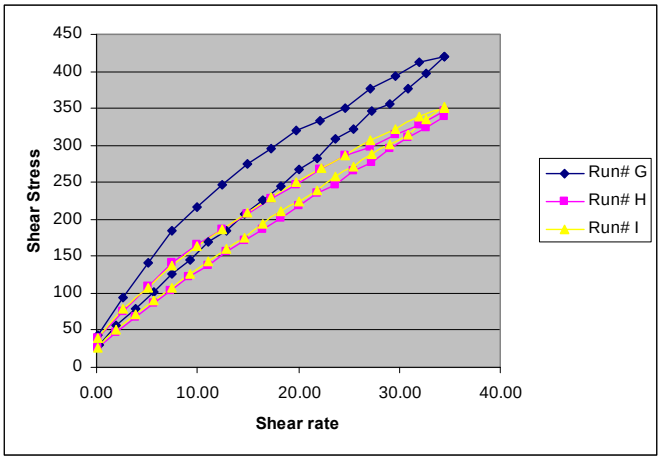
				Average	Stdev
YS	28.4	29.3	26.1	28.0	1.7
VS	7.1	7.4	6.1	6.9	0.7
R2	1.00	1.00	1.00	1.0	0.0
Hysteresis	722	741	381	615	202



Set D1: CS-BX5 – BL11- L1 – Mixing Day – NIST code (folder SR 49-SR-48C)

SR-48C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	43.53	0.20	39.4	0.20	39.78	0.20	40.90
2.65	93.52	2.65	75.85	2.65	79.57	2.65	82.98
5.10	141.4	5.10	108.5	5.10	106.9	5.10	118.93
7.52	185.4	7.52	140.3	7.52	138.1	7.52	154.60
10.00	216.9	10.00	164.9	10.00	163.1	10.00	181.63
12.41	246.5	12.41	187.3	12.41	186.2	12.41	206.67
14.90	275.1	14.90	207.5	14.90	209.3	14.90	230.63
17.31	296.4	17.31	228.7	17.31	230.2	17.31	251.77
19.79	319.2	19.79	247.4	19.79	250.8	19.79	272.47
22.21	332.4	22.21	268	22.28	269	22.23	289.80
24.69	350.4	24.69	285.5	24.69	287	24.69	307.63
27.10	377.1	27.10	297.7	27.17	306.8	27.13	327.20
29.59	393.2	29.59	314.6	29.59	322.4	29.59	343.40
32.00	412.9	32.00	327.2	32.00	339.8	32.00	359.97
34.48	419.7	34.48	347.3	34.48	350.8	34.48	372.60
34.41	419.4	34.48	338.7	34.48	352	34.46	370.03
32.69	398.1	32.69	323.2	32.69	335.1	32.69	352.13
30.90	377.1	30.83	311.3	30.90	315.3	30.87	334.57
29.10	355.1	29.03	296.4	29.03	300.6	29.06	317.37
27.24	346	27.24	276.9	27.24	288.4	27.24	303.77
25.45	322.8	25.45	265.1	25.45	270.2	25.45	286.03
23.66	307.9	23.66	246.6	23.66	257.1	23.66	270.53
21.86	282.4	21.86	235.4	21.86	238.8	21.86	252.20
20.07	266.6	20.00	218.7	20.07	223.5	20.05	236.27
18.21	244.5	18.28	202	18.28	210.3	18.25	218.93
16.41	226	16.41	186.3	16.41	193.9	16.41	202.07
14.62	207.4	14.62	171.9	14.62	175.2	14.62	184.83
12.83	185.3	12.83	156	12.83	159.5	12.83	166.93
11.03	169.6	11.03	137.7	11.03	142.4	11.03	149.90
9.24	145.5	9.17	122.5	9.24	125.3	9.22	131.10
7.45	126.3	7.38	104.4	7.45	107.2	7.43	112.63
5.61	101.9	5.61	87.01	5.61	89.81	5.61	92.91
3.81	79.52	3.81	68.46	3.81	70.85	3.81	72.94
2.00	57.02	1.99	47.97	2.01	49.98	2.00	51.66
0.21	29.59	0.20	26.42	0.21	27.3	0.21	27.77

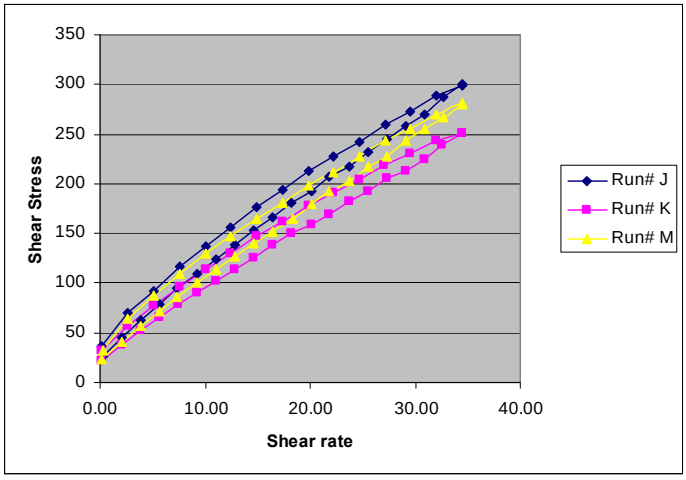
				Average	Stdev
YS	39.9	36.1	37.0	37.7	2.0
VS	11.1	8.9	9.2	9.8	1.2
R2	1.00	1.00	1.00	1.0	0.0
Hysteresis	1493	594	842	976	464



Set D1: CS-BX5 – BL36- L2 – Mixing Day – NIST code (folder SR 49-SR-48D)

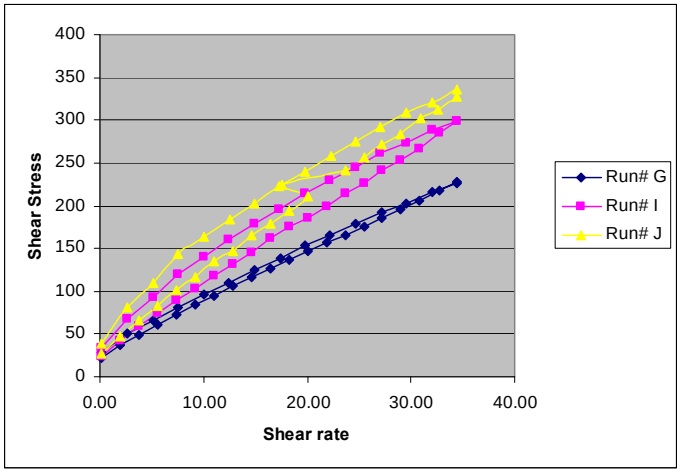
SR-48D							
Run# J		Run# K		Run# M		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	37.07	0.19	32.35	0.21	31.87	0.20	33.76
2.64	69.64	2.65	57.1	2.63	64.66	2.64	63.80
5.10	91.97	5.10	76.69	5.10	87.66	5.10	85.44
7.52	116.5	7.59	96.97	7.52	109.7	7.54	107.72
10.00	136.6	10.00	113.9	10.00	129.1	10.00	126.53
12.41	156.2	12.41	130.4	12.41	146.8	12.41	144.47
14.90	176.8	14.90	147.2	14.90	165	14.90	163.00
17.38	193.9	17.38	162.6	17.31	181	17.36	179.17
19.79	212.6	19.79	178.1	19.79	198	19.79	196.23
22.21	226.8	22.21	190.7	22.21	211.9	22.21	209.80
24.69	242	24.69	203.9	24.69	227.3	24.69	224.40
27.17	259.7	27.10	218.9	27.17	243	27.15	240.53
29.59	272.5	29.59	230.2	29.59	255	29.59	252.57
32.00	288.6	32.00	242.9	32.00	269.7	32.00	267.07
34.48	299.1	34.48	250.9	34.48	281.9	34.48	277.30
34.48	301	34.48	251.2	34.48	280.3	34.48	277.50
32.69	286.9	32.62	238.8	32.69	266.4	32.67	264.03
30.83	270.3	30.90	224.7	30.83	255.9	30.85	250.30
29.03	258.8	29.03	213	29.03	243.7	29.03	238.50
27.24	244.3	27.24	204.9	27.24	227.2	27.24	225.47
25.45	231.5	25.45	192.1	25.45	217.7	25.45	213.77
23.66	217.8	23.66	182.8	23.66	202.4	23.66	201.00
21.86	207	21.86	169.5	21.86	192.2	21.86	189.57
20.07	193	20.07	159	20.07	179.6	20.07	177.20
18.21	180.7	18.21	149.6	18.28	164.8	18.23	165.03
16.41	166.7	16.41	138.5	16.41	151.8	16.41	152.33
14.62	153.5	14.62	125.1	14.62	140.6	14.62	139.73
12.83	139.2	12.83	113.4	12.83	126.9	12.83	126.50
11.03	124.1	11.03	102.8	11.03	113.9	11.03	113.60
9.24	110	9.24	89.83	9.24	100.1	9.24	99.98
7.38	94.92	7.45	78.16	7.38	86.45	7.40	86.51
5.61	78.92	5.61	65.61	5.60	71.44	5.61	71.99
3.81	62.69	3.81	51.98	3.82	56.89	3.81	57.19
2.01	45.03	2.01	38.5	2.01	41.19	2.01	41.57
0.21	25.59	0.20	22.4	0.20	23.26	0.20	23.75

					Average	Stdev
YS	34.7		28.3	29.8	31.0	3.4
VS	7.8		6.5	7.3	7.2	0.7
R2	1.00		1.00	1.00	1.0	0.0
Hysteresis	634		548	537	573	53



Set D3: CS-BX5 – BL11- L2 – 3 day – NIST code (folder SR 50-SR-48A)

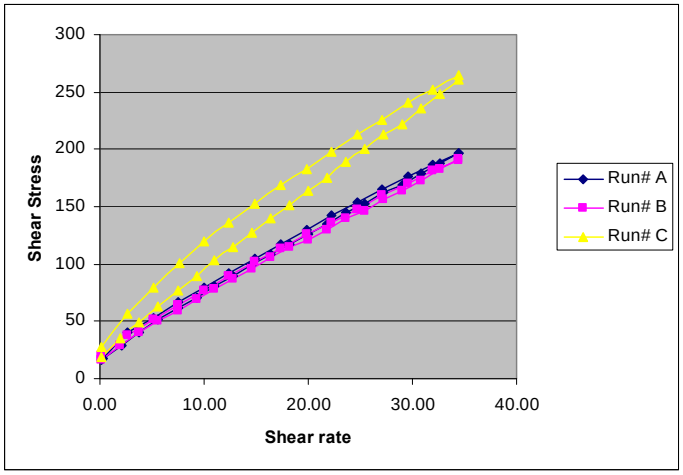
SR-48A							
Run# G		Run# I		Run# J		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	29.44	0.21	34.11	0.20	39.4	0.20	34.32
2.63	50.18	2.65	67.47	2.64	81.05	2.64	66.23
5.10	66.09	5.10	92.42	5.09	110.3	5.10	89.60
7.52	81.5	7.52	119	7.52	144.3	7.52	114.93
10.00	95.8	10.00	140.2	10.00	164	10.00	133.33
12.41	110.3	12.41	160	12.48	183.8	12.44	151.37
14.90	125.2	14.90	179.1	14.90	203.2	14.90	169.17
17.38	139	17.31	196	17.31	222.2	17.33	185.73
19.79	153.2	19.79	213.9	19.79	239.6	19.79	202.23
22.21	165.9	22.21	229.9	22.28	258	22.23	217.93
24.69	178.5	24.69	245.3	24.69	274.7	24.69	232.83
27.17	192	27.10	260.9	27.10	291.3	27.13	248.07
29.59	203.2	29.59	273	29.59	309.2	29.59	261.80
32.00	216	32.00	288.3	32.00	321.4	32.00	275.23
34.48	226.9	34.48	298.9	34.48	336.7	34.48	287.50
34.48	227.5	34.48	298.9	34.48	328.2	34.48	284.87
32.69	217.3	32.69	284.4	32.62	311.7	32.67	271.13
30.83	205.8	30.83	266.1	30.90	301.8	30.85	257.90
29.03	196.1	29.03	253.4	29.03	284.2	29.03	244.57
27.24	186.1	27.24	240.7	27.24	271.8	27.24	232.87
25.45	176.3	25.45	225.9	25.45	256.6	25.45	219.60
23.66	166.2	23.66	213.9	23.66	241.8	23.66	207.30
21.86	156.7	21.86	199.4	17.52	224.7	20.41	193.60
20.07	146.4	20.07	185.9	20.07	211.3	20.07	181.20
18.21	136.8	18.21	175	18.21	193.3	18.21	168.37
16.41	126.3	16.41	161.3	16.41	178.6	16.41	155.40
14.62	115.7	14.62	145.4	14.62	164.8	14.62	141.97
12.83	105.6	12.83	132.1	12.83	147.6	12.83	128.43
11.03	94.26	11.03	118.1	11.03	134.3	11.03	115.55
9.24	83.93	9.24	103.5	9.24	116.2	9.24	101.21
7.38	72.21	7.45	89	7.45	101.2	7.43	87.47
5.61	60.96	5.60	74.81	5.62	82.77	5.61	72.85
3.82	49.19	3.81	59.08	3.80	65.07	3.81	57.78
2.01	36.36	1.99	42.48	2.02	47.79	2.01	42.21
0.20	21.85	0.19	24.06	0.21	26.85	0.20	24.25
						Average	Stdev
YS	27.7		29.7		35.8	31.1	4.2
VS	5.9		7.8		8.7	7.4	1.4
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	251		793		626	557	278



Set D3: CS-BX5 – BL36- L1 – 3 day – NIST code (folder SR 50-SR-48B)

SR-48B							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.26	17.12	0.20	20.13	0.20	27.19	0.22	21.48
2.65	40	2.65	37.94	2.65	56.48	2.65	44.81
5.09	53.53	5.08	51.9	5.08	78.99	5.09	61.47
7.52	66.48	7.52	64.91	7.59	101.3	7.54	77.56
10.00	79.01	10.00	77.01	10.00	119.3	10.00	91.77
12.41	91.83	12.41	89.1	12.41	136.5	12.41	105.81
14.90	104.6	14.90	101.6	14.90	152.5	14.90	119.57
17.38	117.5	17.31	113.7	17.31	168.6	17.33	133.27
19.79	129.8	19.79	125.5	19.79	183.2	19.79	146.17
22.21	141.9	22.21	136.4	22.21	198.4	22.21	158.90
24.69	153.5	24.69	147.6	24.69	212.7	24.69	171.27
27.10	165.1	27.10	159.7	27.10	225.7	27.10	183.50
29.59	176.3	29.59	170.4	29.59	240.3	29.59	195.67
32.00	187.1	32.00	181.5	32.00	252	32.00	206.87
34.48	197	34.48	190.3	34.48	265.1	34.48	217.47
34.48	196.7	34.48	191.3	34.48	261.2	34.48	216.40
32.62	187.5	32.69	182.3	32.62	247.7	32.64	205.83
30.90	178.6	30.90	172.3	30.90	235.7	30.90	195.53
29.03	169.4	29.03	163.6	29.03	222.4	29.03	185.13
27.24	162	27.24	156.2	27.24	212.6	27.24	176.93
25.45	152.7	25.45	146.7	25.45	200	25.45	166.47
23.66	144.5	23.66	139.5	23.66	188.8	23.66	157.60
21.86	134.8	21.86	130.3	21.86	175.3	21.86	146.80
20.07	126.3	20.07	121.5	20.07	164.3	20.07	137.37
18.21	117.7	18.21	114.3	18.21	151.5	18.21	127.83
16.41	108.7	16.41	105.6	16.41	139.8	16.41	118.03
14.62	99.06	14.62	95.73	14.62	127.6	14.62	107.46
12.83	89.66	12.83	87.31	12.83	114.5	12.83	97.16
11.03	80.97	11.03	77.93	11.03	103.6	11.03	87.50
9.24	70.59	9.24	68.87	9.24	89.52	9.24	76.33
7.45	61.29	7.45	59.12	7.45	77.52	7.45	65.98
5.61	51.13	5.61	50.13	5.61	63.35	5.61	54.87
3.81	40.39	3.81	39.83	3.81	49.29	3.81	43.17
2.02	29.49	2.01	28.69	2.01	35.37	2.02	31.18
0.20	16.32	0.20	16.07	0.20	18.51	0.20	16.97

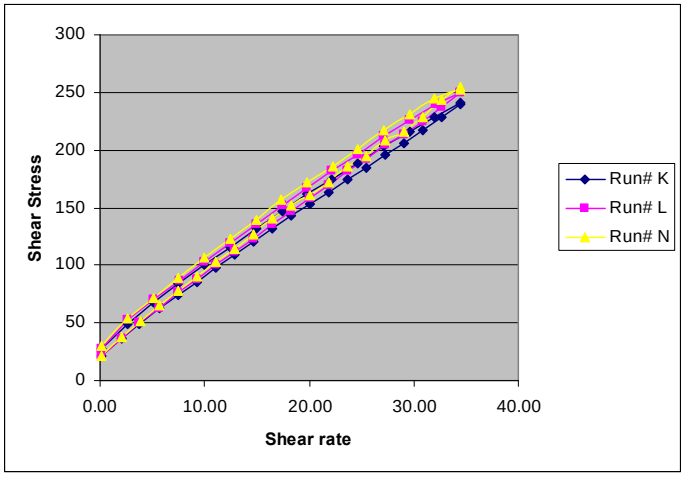
				Average	Stdev
YS	21.7	21.3	24.0	22.3	1.4
VS	5.1	5.0	6.9	5.7	1.1
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	130	175	487	264	195



Set D3: CS-BX5 – BL11- L1 – 3 day – NIST code (folder SR 50-SR-48C)

SR-48C							
Run# K		Run# L		Run# N		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	27.47	0.19	27.84	0.20	29.75	0.20	28.35
2.64	49.13	2.65	52.13	2.64	53.93	2.64	51.73
5.09	67.17	5.09	69.74	5.09	71.97	5.09	69.63
7.52	83.59	7.59	86.52	7.52	89.38	7.54	86.50
10.00	99.84	10.00	102.7	10.00	106.4	10.00	102.98
12.41	115.8	12.41	118.9	12.41	123.2	12.41	119.30
14.90	131.5	14.90	135.5	14.90	139.8	14.90	135.60
17.38	146.6	17.38	151.6	17.31	156.3	17.36	151.50
19.79	161.4	19.79	167.5	19.79	171.7	19.79	166.87
22.21	175.1	22.21	181.4	22.28	185.7	22.23	180.73
24.69	188.7	24.69	196	24.69	200.6	24.69	195.10
27.10	202.9	27.10	211.9	27.10	216.6	27.10	210.47
29.59	216.2	29.59	225.6	29.59	230.4	29.59	224.07
32.00	229	32.07	239.3	32.00	244.5	32.02	237.60
34.48	240.4	34.48	249.6	34.48	252.8	34.48	247.60
34.48	239.6	34.48	249.9	34.48	254.9	34.48	248.13
32.69	228.4	32.62	237.5	32.62	243.1	32.64	236.33
30.90	217	30.90	225.3	30.90	228	30.90	223.43
29.03	206	29.03	213.3	29.03	216.3	29.03	211.87
27.24	196.4	27.24	204.2	27.24	208.9	27.24	203.17
25.45	185.1	25.45	192	25.45	194.9	25.45	190.67
23.66	175.1	23.66	181.8	23.66	186.3	23.66	181.07
21.86	163.7	21.86	169	21.86	171.8	21.86	168.17
20.07	152.9	20.07	158.2	20.07	160.9	20.07	157.33
18.21	142.7	18.21	147	18.21	152	18.21	147.23
16.41	131.9	16.41	135.6	16.41	140.5	16.41	136.00
14.62	120.2	14.62	123.5	14.62	126.2	14.62	123.30
12.83	108.9	12.83	111.5	12.83	114.4	12.83	111.60
11.03	97.92	11.03	100.6	11.03	103.3	11.03	100.61
9.24	85.89	9.24	87.94	9.24	89.99	9.24	87.94
7.45	74.33	7.45	75.99	7.45	78.02	7.45	76.11
5.62	62.34	5.61	63.05	5.61	65.64	5.62	63.68
3.79	49.48	3.80	49.89	3.81	51.76	3.80	50.38
2.01	36.13	2.01	36.43	2.01	37.75	2.01	36.77
0.20	21.01	0.19	20.78	0.21	21.65	0.20	21.15

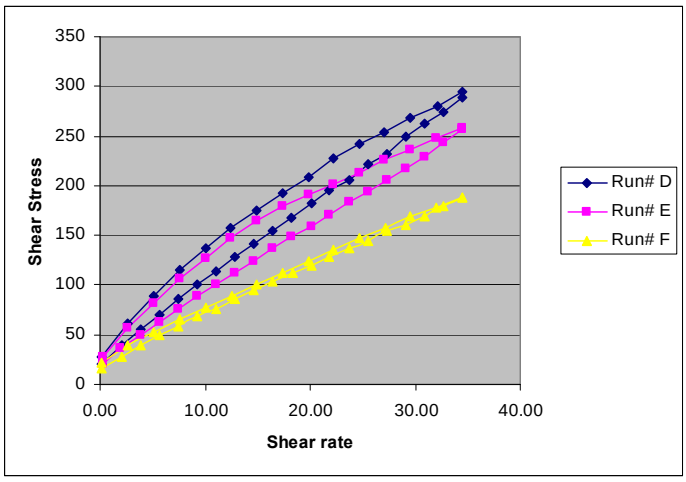
					Average	Stdev
YS	26.6		25.9	27.4	26.6	0.8
VS	6.2		6.5	6.6	6.5	0.2
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	245		318	407	323	81



Set D3: CS-BX5 – BL36- L2 – 3 day – NIST code (folder SR 50-SR-48D)

SR-48D							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	27.42	0.21	27.4	0.20	21.53	0.20	25.45
2.64	61.44	2.64	56.41	2.63	39.22	2.64	52.36
5.08	89.47	5.10	81.65	5.10	53.11	5.09	74.74
7.52	115.4	7.52	106	7.52	65.15	7.52	95.52
10.00	137.4	10.00	127.2	10.00	77.41	10.00	114.00
12.41	156.8	12.41	146.6	12.48	89.11	12.44	130.84
14.90	174.7	14.90	164.9	14.90	100.8	14.90	146.80
17.38	192.3	17.31	179.4	17.31	112.9	17.33	161.53
19.79	209.2	19.79	191	19.79	124.2	19.79	174.80
22.21	227	22.21	201.6	22.28	136.1	22.23	188.23
24.69	242.5	24.69	212.7	24.69	147.2	24.69	200.80
27.10	253.8	27.10	225.4	27.17	157.8	27.13	212.33
29.59	267.9	29.59	235.8	29.59	168.8	29.59	224.17
32.07	279.3	32.00	248.3	32.00	178.6	32.02	235.40
34.48	294.8	34.48	258.1	34.48	187.9	34.48	246.93
34.48	289.2	34.48	256.6	34.48	188.1	34.48	244.63
32.69	274.6	32.69	243.6	32.69	179.3	32.69	232.50
30.90	261.9	30.83	228.9	30.90	169.1	30.87	219.97
29.03	248.9	29.10	217.3	29.03	160.9	29.06	209.03
27.24	231.9	27.24	205.9	27.24	154	27.24	197.27
25.45	221	25.45	193.5	25.45	144.6	25.45	186.37
23.66	205.6	23.66	183.1	23.66	137.3	23.66	175.33
21.86	195.4	21.86	171	21.86	127.9	21.86	164.77
20.07	181.6	20.07	159.1	20.07	119.5	20.07	153.40
18.21	167.4	18.21	148.9	18.28	112.5	18.23	142.93
16.41	154	16.41	137.1	16.41	103.9	16.41	131.67
14.62	141.6	14.62	124.3	14.62	94.09	14.62	120.00
12.83	127.9	12.83	112.7	12.83	85.8	12.83	108.80
11.03	113.5	11.03	100.8	11.03	76.42	11.03	96.91
9.24	99.95	9.24	88.35	9.24	67.84	9.24	85.38
7.45	85.34	7.45	75.85	7.45	58.15	7.45	73.11
5.61	70.28	5.60	63.37	5.60	49.27	5.60	60.97
3.81	54.95	3.81	50.03	3.82	39.25	3.81	48.08
2.01	38.78	1.99	35.93	2.02	28.39	2.01	34.37
0.20	20.83	0.21	20.13	0.20	16.46	0.20	19.14

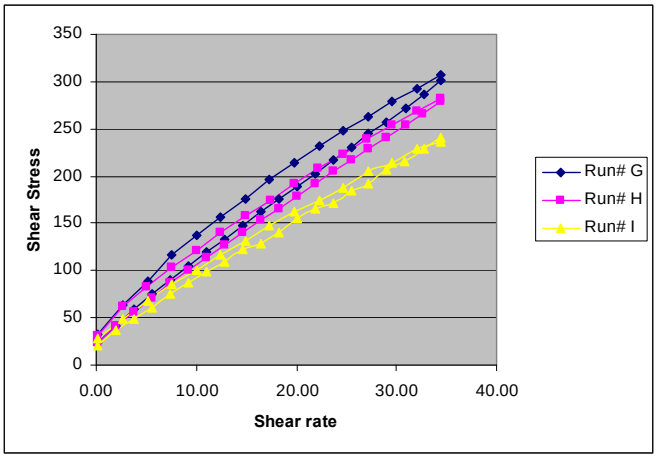
					Average	Stdev
YS	21.1		24.7	21.1	22.3	2.1
VS	4.9		6.7	4.9	5.5	1.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	187		798	187	391	352



Set D7: CS-BX5 – BL11- L2 – 7 day – NIST code (folder SR 51-SR-48A)

SR-48A							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	33.04	0.19	31.7	0.20	27.53	0.20	30.76
2.64	63.28	2.64	61.32	2.63	49.47	2.64	58.02
5.10	89.22	5.08	83	5.10	67.22	5.10	79.81
7.52	116.5	7.52	103.7	7.52	85.11	7.52	101.77
10.00	137	10.00	121.8	10.00	100.9	10.00	119.90
12.41	156.8	12.41	139.8	12.41	116	12.41	137.53
14.90	176.3	14.90	157.3	14.90	131.2	14.90	154.93
17.31	195.7	17.38	174.8	17.31	147	17.33	172.50
19.79	213.6	19.79	191.3	19.79	161.8	19.79	188.90
22.28	231.5	22.21	207.8	22.28	173.9	22.25	204.40
24.69	248.2	24.69	223.5	24.69	187.2	24.69	219.63
27.17	263.6	27.10	239.2	27.17	204.6	27.15	235.80
29.59	278.6	29.59	254.6	29.59	214.3	29.59	249.17
32.00	292	32.00	268.4	32.00	229.4	32.00	263.27
34.48	306.8	34.48	281.9	34.48	237	34.48	275.23
34.48	301.7	34.48	278.6	34.48	240.6	34.48	273.63
32.69	286.3	32.62	265.3	32.69	229	32.67	260.20
30.90	272.1	30.90	254.4	30.83	215.2	30.87	247.23
29.03	257.7	29.03	241.3	29.03	207	29.03	235.33
27.24	244.8	27.24	229.6	27.24	191.5	27.24	221.97
25.45	230.4	25.45	216.9	25.45	185.1	25.45	210.80
23.66	217.2	23.66	204.8	23.66	171.3	23.66	197.77
21.86	202.8	21.86	191.5	21.86	165.4	21.86	186.57
20.07	189.6	20.07	179.2	20.07	154.4	20.07	174.40
18.28	176.2	18.21	165.6	18.28	139.9	18.25	160.57
16.41	162.3	16.41	153.1	16.41	128.8	16.41	148.07
14.62	147.7	14.62	140.4	14.62	121.9	14.62	136.67
12.83	133.6	12.83	126.7	12.83	109.7	12.83	123.33
11.03	119.6	11.03	114.2	11.03	99.14	11.03	110.98
9.24	104.7	9.24	100.1	9.24	87	9.24	97.27
7.38	89.83	7.45	86.59	7.45	75.65	7.43	84.02
5.61	74.6	5.61	71.51	5.61	61.14	5.61	69.08
3.81	58.71	3.80	56.58	3.82	49.05	3.81	54.78
2.00	41.68	2.02	41.32	2.01	36.55	2.01	39.85
0.21	22.97	0.20	23.6	0.19	21.33	0.20	22.63

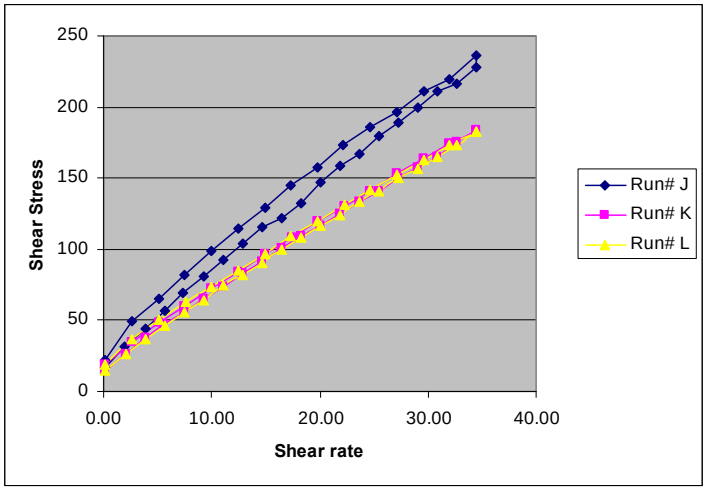
					Average	Stdev
YS	29.1		30.3		26.9	28.8	1.7
VS	7.9		7.3		6.2	7.2	0.9
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	546		328		406	426	110



Set D7: CS-BX5 – BL36- L1 – 7 day – NIST code (folder SR 51-SR-48B)

SR-48B							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	22.47	0.20	18.64	0.21	19	0.20	20.04
2.66	48.88	2.65	35.01	2.65	36.66	2.65	40.18
5.10	65.64	5.10	48.25	5.10	50.17	5.10	54.69
7.52	82.13	7.52	60.38	7.59	62.54	7.54	68.35
10.00	98.8	10.00	72.34	10.00	73.91	10.00	81.68
12.41	114.8	12.41	84.21	12.41	85.49	12.41	94.83
14.90	129	14.90	96.21	14.90	96.91	14.90	107.37
17.31	144.8	17.38	107.9	17.31	108.8	17.33	120.50
19.79	157.3	19.79	119.6	19.79	120	19.79	132.30
22.21	172.9	22.28	130.1	22.28	131.4	22.25	144.80
24.69	186.2	24.69	141.1	24.69	142.2	24.69	156.50
27.10	196	27.17	153.3	27.10	152.2	27.13	167.17
29.59	211.4	29.59	163.9	29.59	163.3	29.59	179.53
32.00	219.7	32.00	174.5	32.00	172.9	32.00	189.03
34.48	236	34.48	183	34.48	183.1	34.48	200.70
34.48	227.5	34.48	184.1	34.48	182.4	34.48	198.00
32.69	216.4	32.69	175.6	32.69	173.8	32.69	188.60
30.90	211.4	30.90	165.4	30.90	165.4	30.90	180.73
29.10	200.1	29.03	157.3	29.03	156.4	29.06	171.27
27.24	188.7	27.24	150.1	27.24	150.1	27.24	162.97
25.45	179.6	25.45	141.1	25.45	141.1	25.45	153.93
23.66	166.9	23.66	133.8	23.66	133.8	23.66	144.83
21.86	158.1	21.86	124.9	21.86	124.1	21.86	135.70
20.00	147.5	20.07	116.6	20.07	116.4	20.05	126.83
18.28	132.8	18.28	109.5	18.21	108.4	18.25	116.90
16.41	122.1	16.41	100.9	16.41	100	16.41	107.67
14.62	115.1	14.62	91.32	14.62	90.81	14.62	99.08
12.83	103.7	12.83	83.26	12.83	82	12.83	89.65
11.03	92.03	11.03	74.02	11.03	74.16	11.03	80.07
9.24	81.06	9.24	65.45	9.24	64.4	9.24	70.30
7.38	69.12	7.45	55.93	7.45	55.78	7.43	60.28
5.61	56.28	5.60	47.3	5.61	46.35	5.60	49.98
3.81	44.34	3.82	37.6	3.81	36.47	3.81	39.47
1.99	31.08	2.01	26.74	2.02	26.41	2.01	28.08
0.20	16.44	0.20	14.98	0.21	14.69	0.20	15.37

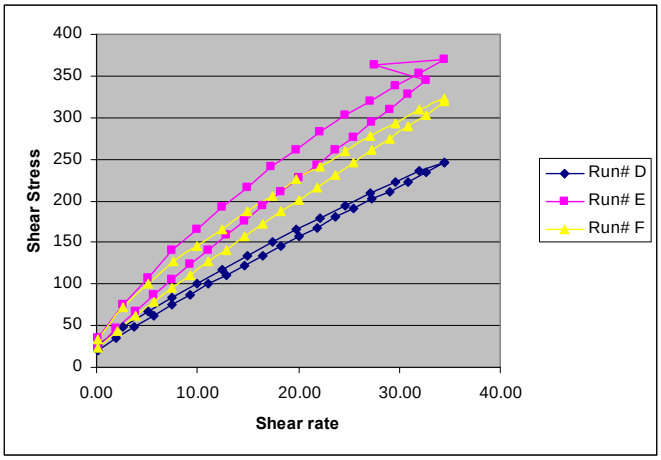
				Average	Stdev
YS	22.3	19.5	19.0	20.3	1.7
VS	6.1	4.8	4.8	5.2	0.8
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	100	150	134	128	26



Set D7: CS-BX5 – BL11- L1 – 7 day – NIST code (folder SR 51-SR-48C)

SR-48C							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	26.33	0.20	34.92	0.20	32.78	0.20	31.34
2.65	49.22	2.64	74.88	2.65	71.27	2.65	65.12
5.08	67.52	5.11	107.9	5.10	100.5	5.10	91.97
7.52	84.35	7.52	140.1	7.59	126.4	7.54	116.95
10.00	101	10.00	166.5	10.00	145.9	10.00	137.80
12.41	117.3	12.41	192.5	12.48	166.1	12.44	158.63
14.90	133.3	14.90	216.5	14.90	187.2	14.90	179.00
17.38	149.8	17.31	240.2	17.38	206.2	17.36	198.73
19.79	165.3	19.79	261.5	19.79	225.3	19.79	217.37
22.21	179.6	22.21	283.1	22.21	241.7	22.21	234.80
24.69	193.9	24.69	302.4	24.69	259.2	24.69	251.83
27.10	209.7	27.10	320.2	27.10	277.6	27.10	269.17
29.59	223.1	29.59	338.9	29.59	293.7	29.59	285.23
32.00	236.2	32.00	353.7	32.00	309.3	32.00	299.73
34.48	246	34.48	369.5	34.48	322.7	34.48	312.73
34.48	246	27.59	364	34.48	319.3	32.18	309.77
32.62	233.5	32.69	345.4	32.62	303.5	32.64	294.13
30.90	222.7	30.90	327.5	30.90	289	30.90	279.73
29.03	210.9	29.03	309.8	29.03	273.7	29.03	264.80
27.24	202.5	27.24	295.3	27.24	261	27.24	252.93
25.45	190.5	25.45	276.9	25.45	245.2	25.45	237.53
23.66	180.5	23.66	261.7	23.66	231.6	23.66	224.60
21.86	167.3	21.86	243.2	21.86	215.5	21.86	208.67
20.07	157.2	20.07	226.9	20.07	201.2	20.07	195.10
18.21	145.1	18.21	210.7	18.21	186.9	18.21	180.90
16.41	134.2	16.41	194	16.41	172.2	16.41	166.80
14.62	122.7	14.62	175.8	14.62	156.6	14.62	151.70
12.83	110.1	12.83	158.6	12.83	140.9	12.83	136.53
11.03	100.3	11.03	141.3	11.03	126.6	11.03	122.73
9.24	86.71	9.24	123.2	9.24	110.3	9.24	106.74
7.45	75.44	7.45	104.7	7.45	95.03	7.45	91.72
5.61	62.02	5.61	86.39	5.61	78.33	5.61	75.58
3.80	48.83	3.82	67.12	3.81	61.11	3.81	59.02
2.01	35.88	2.00	46.41	2.02	43.84	2.01	42.04
0.19	20.02	0.20	23.26	0.20	23.74	0.20	22.34

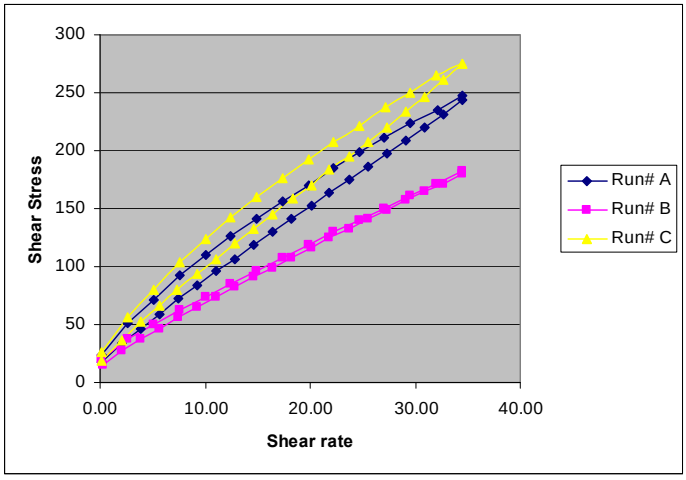
					Average	Stdev
YS	25.6		28.0	30.1	27.9	2.2
VS	6.5		10.1	8.5	8.3	1.8
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	284		750	637	557	243



Set D7: CS-BX5 – BL36- L2– 7 day – NIST code (folder SR 51-SR-48D)

SR-48D							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	23.89	0.20	20.32	0.20	26.22	0.20	23.48
2.65	51.08	2.65	37.21	2.64	56.84	2.65	48.38
5.10	71.81	5.10	50.52	5.10	80.3	5.10	67.54
7.52	92.49	7.52	62.32	7.52	103.9	7.52	86.24
10.00	109.9	10.00	73.83	10.00	123.9	10.00	102.54
12.41	126.1	12.41	85.17	12.41	141.9	12.41	117.72
14.90	141.6	14.90	96.28	14.90	160.3	14.90	132.73
17.38	156.7	17.38	107.9	17.38	176.1	17.38	146.90
19.79	170.6	19.79	118.5	19.79	192.8	19.79	160.63
22.21	185	22.21	129.9	22.21	207.3	22.21	174.07
24.69	198.6	24.69	140.5	24.69	221.8	24.69	186.97
27.10	211.2	27.10	150.1	27.17	237.8	27.13	199.70
29.59	224	29.59	161.1	29.59	249.7	29.59	211.60
32.07	235.4	32.00	170.7	32.00	264.6	32.02	223.57
34.48	247.2	34.48	182	34.48	275.1	34.48	234.77
34.48	243.6	34.48	179.8	34.48	274.9	34.48	232.77
32.69	230.9	32.69	171.7	32.69	261.2	32.69	221.27
30.90	220.3	30.83	165.2	30.90	245.9	30.87	210.47
29.03	208.2	29.03	157.2	29.03	233.9	29.03	199.77
27.24	197.2	27.24	148.4	27.24	219.8	27.24	188.47
25.45	186.3	25.45	141	25.45	207.7	25.45	178.33
23.66	175	23.66	132.2	23.66	194.8	23.66	167.33
21.86	163.4	21.86	124.7	21.86	183.6	21.86	157.23
20.07	152.6	20.07	116.4	20.07	170.4	20.07	146.47
18.21	140.7	18.21	107.1	18.28	158.4	18.23	135.40
16.41	129.7	16.41	98.96	16.41	145.6	16.41	124.75
14.62	118.6	14.62	91.49	14.62	132.6	14.62	114.23
12.83	106.6	12.83	82.6	12.83	120.1	12.83	103.10
11.03	95.79	11.03	73.98	11.03	106.1	11.03	91.96
9.24	83.42	9.24	65.28	9.24	93.58	9.24	80.76
7.45	71.9	7.45	56.37	7.38	79.43	7.43	69.23
5.62	59.03	5.61	46.58	5.61	66.22	5.62	57.28
3.81	46.1	3.81	37.01	3.82	52	3.81	45.04
2.01	33.42	2.01	27.15	2.01	36.22	2.01	32.26
0.19	18.12	0.21	15.46	0.20	19.28	0.20	17.62

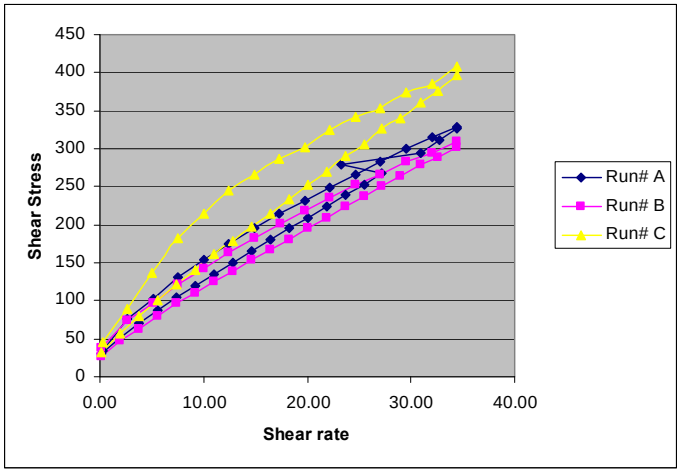
				Average	Stdev
YS	22.4	20.0	24.3	22.2	2.2
VS	6.4	4.7	7.3	6.1	1.3
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	442	59	641	381	296



Set E1: CS-BX5 – BL11- L2 – Mixing Day – NIST code (folder SR 53-SR-52A)

SR-52A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	34.66	0.19	37.79	0.21	45.5	0.20	39.32
2.63	76.01	2.64	73.46	2.65	89.33	2.64	79.60
5.10	101.9	5.09	97	5.08	136.7	5.09	111.87
7.52	130.3	7.52	122.1	7.52	182.4	7.52	144.93
10.00	152.9	10.00	143.2	10.00	213.9	10.00	170.00
12.41	173.9	12.41	163	12.41	244	12.41	193.63
14.90	194.8	14.90	181.9	14.90	265.6	14.90	214.10
17.31	213.7	17.38	201.4	17.31	286.2	17.33	233.77
19.79	231.4	19.79	217.9	19.79	302.7	19.79	250.67
22.21	249.1	22.21	235.9	22.21	324.5	22.21	269.83
24.69	266.1	24.69	251.6	24.69	341.9	24.69	286.53
27.10	283	27.10	266.2	27.10	353	27.10	300.73
29.59	299.4	29.59	282.9	29.59	374.5	29.59	318.93
32.00	314.4	32.00	294.1	32.00	386.2	32.00	331.57
34.48	328.5	34.48	309.1	34.48	407.9	34.48	348.50
34.48	326.1	34.48	302.6	34.48	396.2	34.48	341.63
32.69	310.8	32.62	287.9	32.62	375.6	32.64	324.77
30.90	294.9	30.90	278.4	30.90	360.1	30.90	311.13
23.24	280	29.03	263	29.03	339.8	27.10	294.27
27.24	267.3	27.24	251.5	27.24	326.1	27.24	281.63
25.45	252.1	25.45	237.6	25.45	306.4	25.45	265.37
23.66	238.7	23.66	224.4	23.66	290.3	23.66	251.13
21.86	223.6	21.86	208.7	21.86	269.7	21.86	234.00
20.07	209.5	20.07	196.1	20.07	253.3	20.07	219.63
18.28	196.1	18.21	180.5	18.21	232.7	18.23	203.10
16.41	181.3	16.41	167.1	16.41	215.3	16.41	187.90
14.62	165.8	14.62	154	14.62	197.9	14.62	172.57
12.83	150.8	12.83	138.8	12.83	178	12.83	155.87
11.03	135.6	11.03	126.2	11.03	162	11.03	141.27
9.24	119.7	9.24	110.2	9.24	140.6	9.24	123.50
7.38	103.7	7.45	96.04	7.45	122	7.43	107.25
5.61	87.23	5.62	79.53	5.61	100.2	5.62	88.99
3.82	69.79	3.81	63.28	3.79	78.85	3.81	70.64
2.00	50.86	2.01	47.13	2.01	57.41	2.00	51.80
0.21	29.74	0.20	27.34	0.20	31.48	0.20	29.52

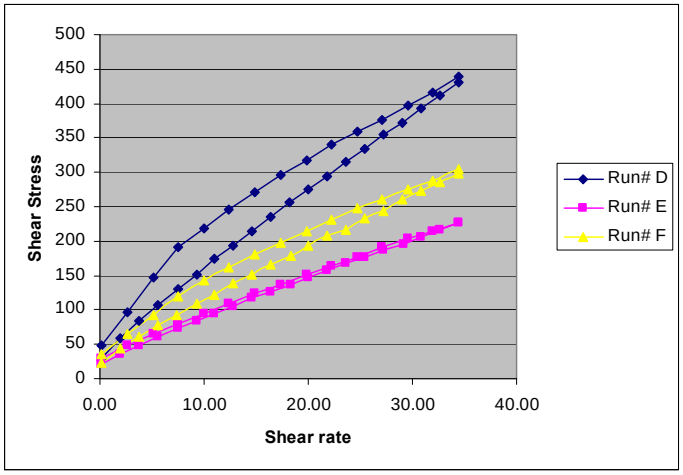
					Average	Stdev
YS	38.8		34.9	41.3	38.3	3.3
VS	8.6		7.9	10.4	9.0	1.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	520		489	1110	706	350



Set E1: CS-BX5 – BL36- L1 – Mixing Day – NIST code (folder SR 53-SR-52B)

SR-52B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	48.15	0.21	28.69	0.20	35.01	0.20	37.28
2.64	96.45	2.66	48.9	2.65	66.08	2.65	70.48
5.10	146.4	5.10	65.24	5.09	93.16	5.10	101.60
7.52	190.8	7.52	80.21	7.52	120.6	7.52	130.54
10.00	218.9	10.00	94.6	10.00	142.1	10.00	151.87
12.41	245.5	12.41	108.8	12.41	162.4	12.41	172.23
14.90	270.5	14.90	122.9	14.90	180.4	14.90	191.27
17.31	295.6	17.31	137.3	17.31	197.2	17.31	210.03
19.79	317.3	19.79	150.5	19.79	213.5	19.79	227.10
22.21	339.7	22.21	164.3	22.21	231.6	22.21	245.20
24.69	359.6	24.69	177.3	24.69	247.5	24.69	261.47
27.10	377	27.10	190.2	27.10	259.6	27.10	275.60
29.59	398.1	29.59	203.5	29.59	274.3	29.59	291.97
32.00	416.3	32.00	215	32.00	287.2	32.00	306.17
34.48	438.7	34.48	227.6	34.48	303.8	34.48	323.37
34.48	431.7	34.48	225.9	34.48	298.2	34.48	318.60
32.69	411.1	32.69	215.8	32.69	285.1	32.69	304.00
30.90	392.1	30.83	206.5	30.83	272.9	30.85	290.50
29.03	371.6	29.10	196.4	29.03	260.6	29.06	276.20
27.24	354.3	27.24	187.1	27.24	242.7	27.24	261.37
25.45	333.2	25.45	177.5	25.45	232.3	25.45	247.67
23.66	314.9	23.66	167.5	23.66	216.6	23.66	233.00
21.86	293.7	21.86	157.3	21.86	207.3	21.86	219.43
20.07	274.7	20.07	147.7	20.00	192.8	20.05	205.07
18.21	255.4	18.28	136.8	18.28	179.1	18.25	190.43
16.41	235.7	16.41	126.4	16.41	165.1	16.41	175.73
14.62	215	14.62	116.6	14.62	152	14.62	161.20
12.83	194.2	12.83	105.6	12.83	138.2	12.83	146.00
11.03	173.9	11.03	95.44	11.03	122	11.03	130.45
9.24	152	9.24	83.79	9.24	108.8	9.24	114.86
7.45	130.2	7.45	73	7.38	92.81	7.43	98.67
5.60	107.4	5.60	60.83	5.61	77.32	5.60	81.85
3.81	83.76	3.80	48.81	3.81	61.15	3.81	64.57
2.01	58.38	1.99	36.06	1.99	43.07	2.00	45.84
0.20	30.02	0.20	21.54	0.20	24	0.20	25.19

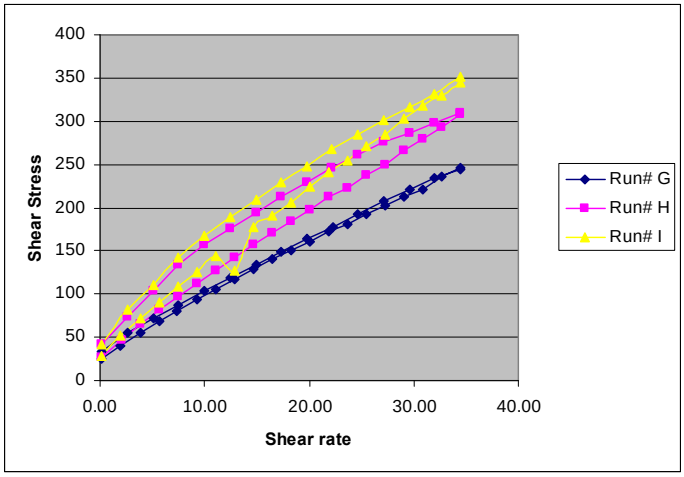
					Average	Stdev
YS	42.1		27.9	32.9	34.3	7.2
VS	11.4		5.8	7.8	8.4	2.8
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	1081		119	490	563	485



Set E1: CS-BX5 – BL11- L1 – Mixing Day – NIST code (folder SR 53-SR-52C)

SR-52C							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	33.2	0.20	42.05	0.21	41.18	0.20	38.81
2.63	54.55	2.64	73.69	2.65	81.21	2.64	69.82
5.11	71.47	5.10	104.6	5.10	110.8	5.10	95.62
7.52	87.72	7.52	133.4	7.52	142.6	7.52	121.24
10.00	103	10.00	157.6	10.00	166.8	10.00	142.47
12.41	118.2	12.41	176.3	12.41	188.3	12.41	160.93
14.90	133.2	14.90	193.5	14.90	208.8	14.90	178.50
17.31	149	17.31	211.8	17.31	228.5	17.31	196.43
19.79	163.7	19.79	228.8	19.79	248.2	19.79	213.57
22.28	177.7	22.21	245.3	22.21	267.1	22.23	230.03
24.69	191.8	24.69	260.5	24.69	284.7	24.69	245.67
27.10	207.8	27.17	275.4	27.17	300.6	27.15	261.27
29.59	221.5	29.59	285.5	29.59	316.2	29.59	274.40
32.00	234.9	32.00	298.5	32.00	331	32.00	288.13
34.48	244.3	34.48	310.1	34.48	350.7	34.48	301.70
34.48	246.5	34.48	308.4	34.48	345.2	34.48	300.03
32.69	235.8	32.69	293.4	32.69	328.9	32.69	286.03
30.83	221.7	30.83	279	30.83	317.8	30.83	272.83
29.03	212.7	29.03	266.6	29.03	302.5	29.03	260.60
27.24	201.7	27.24	249.2	27.24	284.6	27.24	245.17
25.45	191.8	25.45	238.3	25.45	271.5	25.45	233.87
23.66	180.8	23.66	222.5	23.66	254.3	23.66	219.20
21.86	172	21.86	212.6	21.86	240.3	21.86	208.30
20.07	160.6	20.07	197.5	20.07	225	20.07	194.37
18.21	151.3	18.28	184.9	18.21	206.1	18.23	180.77
16.41	140.1	16.41	170.8	16.41	190.2	16.41	167.03
14.62	128.4	14.62	157.2	14.62	176.6	14.62	154.07
12.83	117.6	12.83	142.6	12.83	127.7	12.83	129.30
11.03	104.7	11.03	126.5	11.03	143.7	11.03	124.97
9.24	93.83	9.24	112.8	9.24	126	9.24	110.88
7.38	81	7.45	96.39	7.45	108.9	7.43	95.43
5.61	68.86	5.61	81.83	5.61	89.6	5.61	80.10
3.82	55.49	3.81	65.17	3.82	71.3	3.82	63.99
2.01	40.42	2.01	46.7	2.00	51.72	2.01	46.28
0.20	24.57	0.20	26.92	0.21	28.97	0.20	26.82

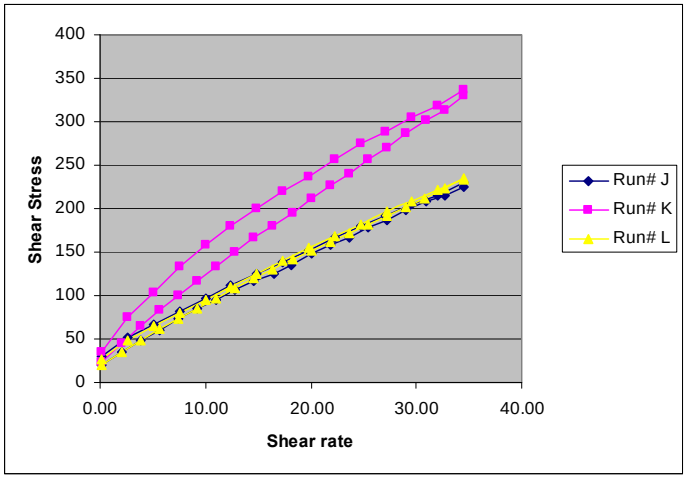
					Average	Stdev
YS	32.9		35.7	36.0	34.9	1.7
VS	6.3		8.0	9.1	7.8	1.4
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	241		874	646	587	321



Set E1: CS-BX5 – BL36- L2 – Mixing Day – NIST code (folder SR 53-SR-52D)

SR-52D							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	30.55	0.20	34.84	0.20	27	0.20	30.80
2.65	51.92	2.65	74.77	2.64	48.48	2.65	58.39
5.09	66.75	5.10	104	5.10	65.18	5.10	78.64
7.59	81.94	7.59	134.1	7.52	80.63	7.56	98.89
10.00	96.82	10.00	158	10.00	95.57	10.00	116.80
12.41	111.3	12.41	179.7	12.41	110.5	12.41	133.83
14.90	125.1	14.90	199.6	14.90	125.7	14.90	150.13
17.31	139	17.31	219.3	17.31	140.2	17.31	166.17
19.79	152.4	19.79	237.3	19.79	155	19.79	181.57
22.21	167.1	22.21	257.3	22.21	168.1	22.21	197.50
24.69	180.4	24.69	274.6	24.69	181.8	24.69	212.27
27.10	190.9	27.10	287.9	27.17	196.5	27.13	225.10
29.59	204.5	29.59	305	29.59	208.9	29.59	239.47
32.00	214.8	32.00	318.4	32.00	222.5	32.00	251.90
34.48	229.5	34.48	337.2	34.48	233.1	34.48	266.60
34.48	224.9	34.48	329.9	34.48	234.2	34.48	263.00
32.69	214.6	32.69	314	32.69	223.7	32.69	250.77
30.90	208.2	30.90	302.2	30.83	211.7	30.87	240.70
29.03	197.9	29.03	287.1	29.03	202.4	29.03	229.13
27.24	186.9	27.24	269.3	27.24	191.6	27.24	215.93
25.45	178.3	25.45	256.7	25.45	181.3	25.45	205.43
23.66	167	23.66	239.3	23.66	171.1	23.66	192.47
21.86	158.3	21.86	227.3	21.86	162	21.86	182.53
20.07	148.1	20.07	212	20.07	151	20.07	170.37
18.21	135.8	18.28	195.4	18.28	141.1	18.25	157.43
16.48	125.5	16.41	180.2	16.41	130.2	16.44	145.30
14.62	117.2	14.62	166	14.62	119.3	14.62	134.17
12.83	106.1	12.83	149.9	12.83	108.5	12.83	121.50
11.03	95.1	11.03	133.5	11.03	96.23	11.03	108.28
9.24	84.31	9.24	117.5	9.24	85.54	9.24	95.78
7.45	72.89	7.45	100.6	7.38	73.14	7.43	82.21
5.61	60.3	5.61	82.56	5.61	61.18	5.61	68.01
3.81	48.23	3.81	64.27	3.81	48.56	3.81	53.69
2.01	35.43	2.01	45.08	2.01	34.54	2.01	38.35
0.20	20.8	0.19	23.97	0.20	19.6	0.20	21.46

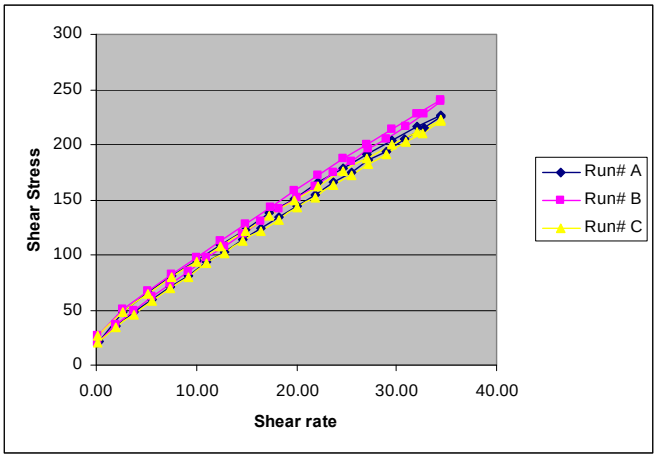
					Average	Stdev
YS	27.5		33.0	26.5	29.0	3.5
VS	5.9		8.8	6.1	6.9	1.6
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	83		588	215	295	262



Set E3: CS-BX5 – BL11- L2 – 3 day – NIST code (folder SR 54-SR-52A)

SR-52A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	21.07	0.20	26.63	0.20	26.3	0.23	24.67
2.64	48.35	2.65	50.84	2.65	47.78	2.65	48.99
5.10	65.33	5.09	67.35	5.10	64.06	5.09	65.58
7.52	80.42	7.59	81.93	7.52	79.27	7.54	80.54
10.00	94.88	10.00	97.16	10.00	93.23	10.00	95.09
12.41	108.8	12.41	112.7	12.41	107.6	12.41	109.70
14.90	122.8	14.90	127.7	14.90	121.6	14.90	124.03
17.31	137.5	17.38	143.2	17.31	135.8	17.33	138.83
19.79	151.1	19.79	157.9	19.79	149.3	19.79	152.77
22.21	165.2	22.21	172.7	22.21	162.6	22.21	166.83
24.69	178	24.69	186.9	24.69	175.4	24.69	180.10
27.10	191.3	27.10	200.2	27.10	187.9	27.10	193.13
29.59	204	29.59	214.4	29.59	200.6	29.59	206.33
32.00	216	32.00	227.3	32.00	211.9	32.00	218.40
34.48	226.7	34.48	240.3	34.48	223.2	34.48	230.07
34.48	225.7	34.48	239.2	34.48	220.9	34.48	228.60
32.69	215	32.69	227.8	32.62	210.2	32.67	217.67
30.83	204.7	30.90	216.2	30.90	201.9	30.87	207.60
29.03	193.7	29.03	205.3	29.03	191.4	29.03	196.80
27.24	185.6	27.24	195.7	27.24	182.4	27.24	187.90
25.45	174.7	25.45	184.4	25.45	172.5	25.45	177.20
23.66	165.5	23.66	174.2	23.66	162.8	23.66	167.50
21.86	153.9	21.86	162.6	21.86	152.1	21.86	156.20
20.07	144.7	20.07	152.1	20.07	142.8	20.07	146.53
18.21	134.8	18.21	141.6	18.21	131.6	18.21	136.00
16.41	124.6	16.48	130.8	16.41	121.9	16.44	125.77
14.62	113.5	14.62	119.1	14.62	112.2	14.62	114.93
12.83	102.6	12.83	107.9	12.83	101	12.83	103.83
11.03	93.21	11.03	96.95	11.03	91.88	11.03	94.01
9.24	81.34	9.24	85.09	9.24	80.14	9.24	82.19
7.45	70.76	7.45	73.65	7.45	70.06	7.45	71.49
5.61	59.46	5.61	61.92	5.61	57.88	5.61	59.75
3.82	47.51	3.81	49.49	3.80	46.14	3.81	47.71
2.01	35.08	2.01	36.26	2.01	34.57	2.01	35.30
0.19	20.29	0.20	20.79	0.21	20.22	0.20	20.43

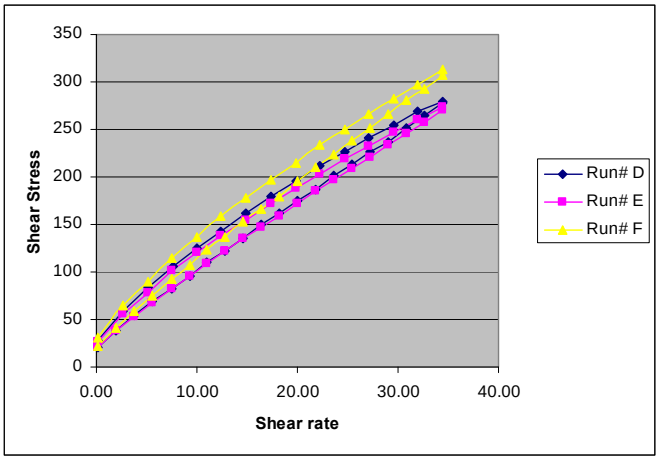
					Average	Stdev
YS	25.9		26.1	25.5	25.8	0.3
VS	5.9		6.2	5.8	5.9	0.2
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	212		193	179	195	17



Set E3: CS-BX5 – BL36- L1 – 3 day – NIST code (folder SR 54-SR-52B)

SR-52B							
Run# D		Run# E		Run# F		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	27.78	0.20	26.71	0.21	30.46	0.20	28.32
2.65	58.25	2.65	55.21	2.65	65.3	2.65	59.59
5.08	83.22	5.10	78.11	5.09	89.65	5.09	83.66
7.59	105.5	7.52	101.8	7.52	114	7.54	107.10
10.00	124.6	10.00	120.5	10.00	137.3	10.00	127.47
12.41	143.3	12.41	137.9	12.41	158.4	12.41	146.53
14.90	161.4	14.90	154.7	14.90	177.9	14.90	164.67
17.31	178.8	17.31	171.4	17.38	197.3	17.33	182.50
19.79	195.6	19.79	187.5	19.79	214.5	19.79	199.20
22.21	211.4	22.21	203.4	22.21	233.6	22.21	216.13
24.69	225.8	24.69	218.7	24.69	250.5	24.69	231.67
27.10	240.6	27.10	233	27.10	265.5	27.10	246.37
29.59	254.9	29.59	247.6	29.59	282.8	29.59	261.77
32.00	268.6	32.00	260.3	32.00	296.8	32.00	275.23
34.48	279.7	34.48	274.1	34.48	313.2	34.48	289.00
34.48	278.1	34.48	270.1	34.48	307	34.48	285.07
32.62	264.4	32.69	257	32.62	292.3	32.64	271.23
30.90	250.8	30.90	245.9	30.90	281	30.90	259.23
29.03	237.3	29.03	233.4	29.03	266.5	29.03	245.73
27.24	226.4	27.24	220.8	27.24	252.1	27.24	233.10
25.45	212.7	25.45	209.1	25.45	238.5	25.45	220.10
23.66	201	23.66	196.5	23.66	224	23.66	207.17
21.86	186.6	21.86	184.6	21.86	210.1	21.86	193.77
20.07	174.4	20.07	172.6	20.07	196.1	20.07	181.03
18.21	162.1	18.21	159.2	18.21	180	18.21	167.10
16.41	149.4	16.41	146.8	16.41	165.8	16.41	154.00
14.62	135.6	14.62	135.2	14.62	152.7	14.62	141.17
12.83	122.3	12.83	122.1	12.83	137.3	12.83	127.23
11.03	110	11.03	109.1	11.03	122.9	11.03	114.00
9.24	95.7	9.24	95.81	9.24	107.4	9.24	99.64
7.45	82.57	7.45	82.25	7.45	92.09	7.45	85.64
5.61	68.52	5.59	67.6	5.62	75.11	5.61	70.41
3.80	53.69	3.81	53.31	3.81	58.67	3.81	55.22
2.01	38.77	1.99	38.05	2.01	41.57	2.00	39.46
0.20	21.13	0.20	20.61	0.20	21.47	0.20	21.07

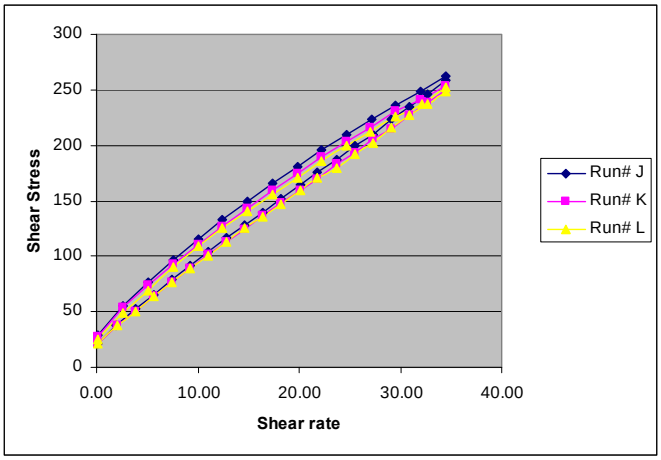
				Average	Stdev
YS	26.4	27.4	28.9	27.6	1.3
VS	7.3	7.1	8.2	7.6	0.6
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	564	359	409	444	107



Set E3: CS-BX5 – BL11- L1 – 3 day – NIST code (folder SR 54-SR-52C)

SR-52C							
Run# J		Run# K		Run# L		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	28.26	0.20	28.06	0.20	25.04	0.20	27.12
2.63	55.12	2.65	54.07	2.66	48.43	2.64	52.54
5.10	76.25	5.09	73.92	5.08	69.55	5.09	73.24
7.52	96.6	7.59	93.3	7.59	90.67	7.56	93.52
10.00	115.4	10.00	110.4	10.00	109.1	10.00	111.63
12.41	132.6	12.41	127.1	12.41	125.5	12.41	128.40
14.90	149.7	14.90	142.7	14.90	141	14.90	144.47
17.31	165.5	17.31	159.3	17.38	156	17.33	160.27
19.79	181.1	19.79	174.1	19.79	170.9	19.79	175.37
22.21	195.8	22.21	189.8	22.21	186	22.21	190.53
24.69	210	24.69	203.9	24.69	200.1	24.69	204.67
27.17	223.1	27.10	216.2	27.10	212.3	27.13	217.20
29.59	236.5	29.59	230.8	29.59	225.6	29.59	230.97
32.00	248.8	32.00	241.5	32.07	237.7	32.02	242.67
34.48	262.5	34.48	253.3	34.48	252.1	34.48	255.97
34.48	258.5	34.48	250	34.48	248.3	34.48	252.27
32.69	246	32.69	237.9	32.69	236.7	32.69	240.20
30.83	234.5	30.90	227	30.90	226.8	30.87	229.43
29.03	223	29.03	214.7	29.03	215.6	29.03	217.77
27.24	209.9	27.24	205.5	27.24	202.3	27.24	205.90
25.45	199.4	25.45	193.3	25.45	192.6	25.45	195.10
23.66	186.8	23.66	182.8	23.66	180.1	23.66	183.23
21.86	175.8	21.86	170	21.86	170.5	21.86	172.10
20.07	164.5	20.07	159.3	20.07	159.1	20.07	160.97
18.21	151.7	18.21	147.5	18.21	146.7	18.21	148.63
16.41	139.8	16.41	136.3	16.41	135.4	16.41	137.17
14.62	128.6	14.62	124.4	14.62	124.9	14.62	125.97
12.83	116.3	12.83	112.4	12.83	112.9	12.83	113.87
11.03	104.4	11.03	101.6	11.03	101	11.03	102.33
9.24	91.55	9.24	88.54	9.24	89.05	9.24	89.71
7.45	79.07	7.45	76.81	7.45	76.95	7.45	77.61
5.61	65.52	5.61	63.97	5.61	63.95	5.61	64.48
3.81	52.17	3.81	50.77	3.81	50.78	3.81	51.24
2.00	37.8	2.01	37.37	2.01	37.05	2.00	37.41
0.20	21.65	0.20	21.39	0.19	21.27	0.20	21.44

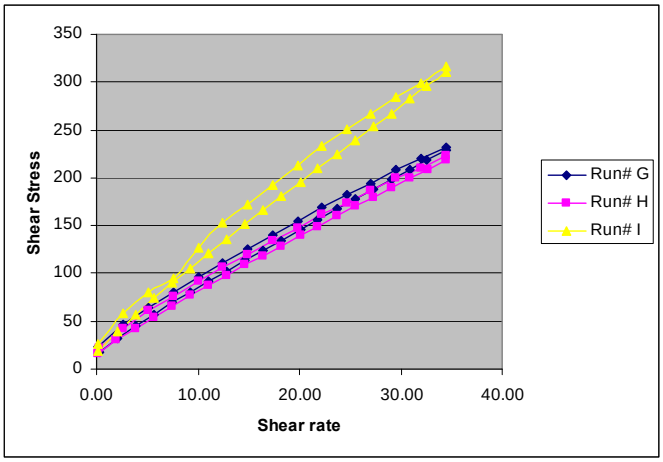
					Average	Stdev
YS	27.1		26.7	27.0	26.9	0.2
VS	6.8		6.5	6.5	6.6	0.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	371		361	243	325	71



Set E3: CS-BX5 – BL36- L2 – 3 day – NIST code (folder SR 54-SR-52D)

SR-52D							
Run# G		Run# H		Run# I		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	22.96	0.21	21.46	0.20	26.65	0.20	23.69
2.64	46.35	2.65	42.96	2.64	58.13	2.64	49.15
5.08	64.35	5.10	60.7	5.08	80.92	5.09	68.66
7.52	80.49	7.52	76.37	7.52	95.16	7.52	84.01
10.00	96.16	10.00	91.42	10.00	126.2	10.00	104.59
12.41	111.2	12.41	106.1	12.41	152.6	12.41	123.30
14.90	125.7	14.90	119.9	14.90	172.7	14.90	139.43
17.31	140.4	17.31	134.3	17.38	193.2	17.33	155.97
19.79	154.3	19.79	147.7	19.79	212.5	19.79	171.50
22.21	168.6	22.21	161.5	22.21	232.7	22.21	187.60
24.69	181.9	24.69	174.2	24.69	251	24.69	202.37
27.10	194.2	27.10	186.6	27.10	266.9	27.10	215.90
29.59	207.9	29.59	199.5	29.59	284.8	29.59	230.73
32.00	219.6	32.00	210.3	32.00	299.5	32.00	243.13
34.48	232.2	34.48	222.8	34.48	316.5	34.48	257.17
34.48	229.3	34.48	219.1	34.48	311.1	34.48	253.17
32.62	218.2	32.69	208.5	32.62	295.8	32.64	240.83
30.90	208.9	30.90	200	30.90	282.5	30.90	230.47
29.03	197.8	29.10	189.3	29.03	267.2	29.06	218.10
27.24	187.7	27.24	179.8	27.24	254.2	27.24	207.23
25.45	177.7	25.45	170	25.45	239	25.45	195.57
23.66	167	23.66	159.7	23.66	225.3	23.66	184.00
21.86	156.6	21.86	149.3	21.86	209.5	21.86	171.80
20.07	146.3	20.07	139.8	20.07	195.4	20.07	160.50
18.21	134.7	18.21	128.3	18.21	180.4	18.21	147.80
16.41	124.3	16.41	118.2	16.41	166	16.41	136.17
14.62	114	14.62	108.9	14.62	151.2	14.62	124.70
12.83	102.4	12.83	97.81	12.83	135.9	12.83	112.04
11.03	92.16	11.03	88.21	11.03	121.6	11.03	100.66
9.24	80.3	9.24	76.64	9.24	105.3	9.24	87.41
7.45	69.36	7.45	66.3	7.45	90.14	7.45	75.27
5.61	56.9	5.61	53.94	5.61	73.72	5.61	61.52
3.81	44.48	3.81	42.38	3.81	56.71	3.81	47.86
2.02	32.16	1.99	30.57	2.01	39.3	2.01	34.01
0.21	17.48	0.20	16.72	0.20	18.92	0.20	17.71

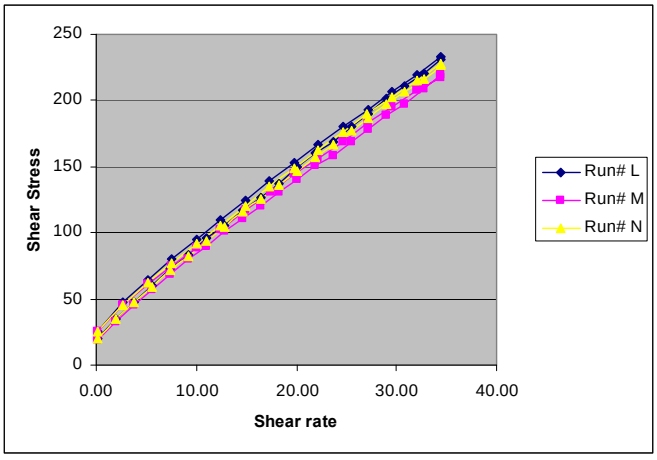
				Average	Stdev
YS	22.6	21.4	25.9	23.3	2.3
VS	6.1	5.8	8.4	6.8	1.4
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	208	168	304	227	70



Set E7: CS-BX5 – BL11- L2 – 7 day – NIST code (folder SR 55-SR-52A)

SR-52A							
Run# L		Run# M		Run# N		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	25.67	0.20	25.35	0.20	25.05	0.20	25.36
2.65	47.05	2.65	45.51	2.65	45.3	2.65	45.95
5.10	63.92	5.10	61.21	5.10	61.96	5.10	62.36
7.52	79.83	7.52	75.21	7.52	77.07	7.52	77.37
10.00	95.18	10.00	88.82	10.00	91.36	10.00	91.79
12.41	109.9	12.41	102.6	12.41	105.7	12.41	106.07
14.90	124.5	14.90	117.1	14.90	120.4	14.90	120.67
17.31	138.8	17.38	131.1	17.31	134.7	17.33	134.87
19.79	153	19.79	144.6	19.79	149	19.79	148.87
22.21	167.1	22.21	156.5	22.21	162.9	22.21	162.17
24.69	180.7	24.69	169	24.69	176.5	24.69	175.40
27.17	193.5	27.17	183.7	27.10	189.9	27.15	189.03
29.59	206.5	29.59	195	29.59	202.8	29.59	201.43
32.00	218.9	32.00	208.3	32.00	215.5	32.00	214.23
34.48	232.8	34.48	216.8	34.48	227.9	34.48	225.83
34.48	230.5	34.48	219	34.48	226.5	34.48	225.33
32.69	220.2	32.69	209	32.69	216.3	32.69	215.17
30.83	211.4	30.83	196.9	30.83	206.8	30.83	205.03
29.03	201.4	29.03	188.5	29.03	196.9	29.03	195.60
27.24	189.8	27.24	177.8	27.24	187.1	27.24	184.90
25.45	180.6	25.45	168.7	25.45	177.2	25.45	175.50
23.66	169.2	23.66	158.6	23.66	167.1	23.66	164.97
21.86	159.9	21.86	150.5	21.86	157	21.86	155.80
20.07	149.6	20.07	140.2	20.07	146.8	20.07	145.53
18.28	137.5	18.21	130.6	18.21	135.8	18.23	134.63
16.41	127	16.41	120.5	16.41	125.4	16.41	124.30
14.62	117.4	14.62	110.7	14.62	115.6	14.62	114.57
12.83	105.9	12.83	100.9	12.83	104.7	12.83	103.83
11.03	95.48	11.03	89.27	11.03	94.04	11.03	92.93
9.24	83.85	9.24	79.74	9.24	82.79	9.24	82.13
7.45	72.58	7.38	68.47	7.45	71.51	7.43	70.85
5.60	59.85	5.61	57.03	5.60	59.34	5.60	58.74
3.82	47.73	3.81	45.64	3.81	47.39	3.81	46.92
2.01	35.15	2.01	33.08	2.00	34.56	2.01	34.26
0.20	20.37	0.20	19.37	0.20	20.12	0.20	19.95

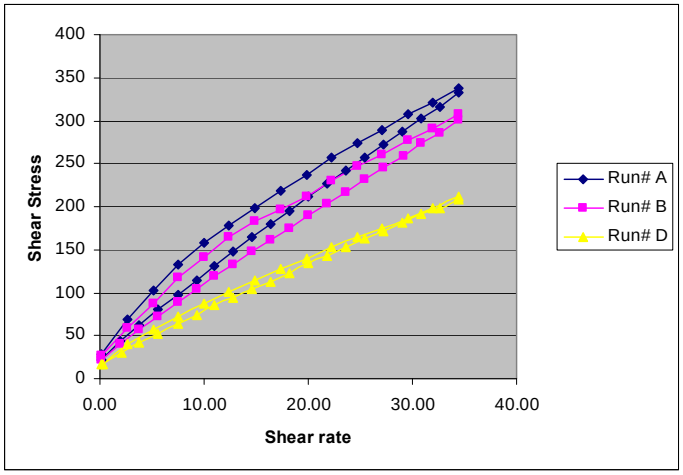
					Average	Stdev
YS	26.0		25.0		26.1	25.7	0.6
VS	6.0		5.7		5.9	5.9	0.2
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	101		249		86	145	90



Set E7: CS-BX5 – BL36- L1 – 7 day – NIST code (folder SR 55-SR-52B)

SR-52B							
Run# A		Run# B		Run# D		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	28.46	0.21	26.61	0.26	16.57	0.22	23.88
2.65	69.06	2.65	59.3	2.63	40.53	2.64	56.30
5.09	102.6	5.10	87.05	5.09	57.15	5.09	82.27
7.52	133	7.52	118.1	7.52	72.38	7.52	107.83
10.00	157.3	10.00	141.2	10.00	86.84	10.00	128.45
12.41	177.8	12.41	165.3	12.41	100.9	12.41	148.00
14.90	197.5	14.90	182.4	14.90	114.1	14.90	164.67
17.31	218.1	17.31	195.8	17.31	127.3	17.31	180.40
19.79	236.9	19.79	211.8	19.79	139.6	19.79	196.10
22.21	256.7	22.21	229.6	22.21	152.9	22.21	213.07
24.69	274.4	24.69	246.3	24.69	164.9	24.69	228.53
27.10	289.4	27.10	261.2	27.10	174.8	27.10	241.80
29.59	306.8	29.59	278	29.59	187.2	29.59	257.33
32.00	321	32.00	290.5	32.00	197.9	32.00	269.80
34.48	338.5	34.48	307	34.48	211.2	34.48	285.57
34.48	332.7	34.48	300.7	34.48	207.8	34.48	280.40
32.69	316.6	32.69	285.9	32.69	198	32.69	266.83
30.90	303.3	30.83	274	30.90	191.2	30.87	256.17
29.03	287.7	29.10	259.5	29.03	181.4	29.06	242.87
27.24	272	27.24	244.6	27.24	171.4	27.24	229.33
25.45	257.5	25.45	231.7	25.45	162.9	25.45	217.37
23.66	241.4	23.66	216.6	23.66	152.7	23.66	203.57
21.86	226.7	21.86	204	21.86	143.5	21.86	191.40
20.07	211.2	20.07	190	20.07	134.3	20.07	178.50
18.21	194.5	18.21	174.8	18.21	122.8	18.21	164.03
16.41	179.1	16.41	160.8	16.41	113.3	16.41	151.07
14.62	164.2	14.62	147.7	14.62	104.9	14.62	138.93
12.83	147.6	12.83	133.2	12.83	94.49	12.83	125.10
11.03	131.9	11.03	118.5	11.03	85.08	11.03	111.83
9.24	114.8	9.24	103.8	9.24	74.25	9.24	97.62
7.45	98.23	7.45	88.69	7.45	64.24	7.45	83.72
5.61	80.18	5.61	72.94	5.61	52.63	5.61	68.58
3.80	62.03	3.81	57.1	3.79	41.58	3.80	53.57
2.01	43.42	1.99	39.92	2.02	30.22	2.01	37.85
0.20	21.73	0.20	21.13	0.20	16.53	0.20	19.80

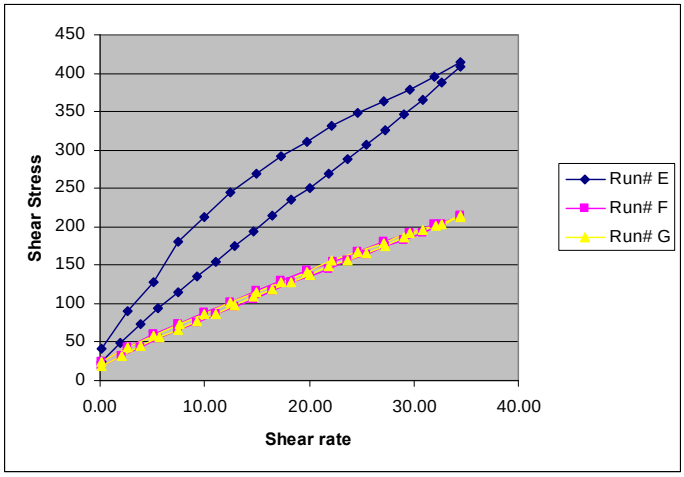
					Average	Stdev
YS	29.8		27.4	21.8	26.3	4.1
VS	8.9		8.0	5.5	7.5	1.8
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	630		523	95	416	283



Set E7: CS-BX5 – BL11- L1 – 7 day – NIST code (folder SR 55-SR-52C)

SR-52C							
Run# E		Run# F		Run# G		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	41.41	0.21	24.42	0.20	23.81	0.20	29.88
2.65	89.56	2.63	43.76	2.65	43.13	2.64	58.82
5.08	128.1	5.10	59.57	5.09	59.16	5.09	82.28
7.52	180.5	7.52	74.19	7.59	73.1	7.54	109.26
10.00	213.7	10.00	88.43	10.00	87.19	10.00	129.77
12.41	244.4	12.41	102.3	12.41	101.3	12.41	149.33
14.90	268.9	14.90	115.9	14.90	114.8	14.90	166.53
17.31	291.5	17.31	129.4	17.31	128.3	17.31	183.07
19.79	311.3	19.79	142.7	19.79	141.3	19.79	198.43
22.21	331.6	22.28	155.2	22.21	155.4	22.23	214.07
24.69	348.5	24.69	167.4	24.69	168.1	24.69	228.00
27.10	363	27.10	180.6	27.10	178.8	27.10	240.80
29.59	378.2	29.59	192.4	29.59	191.2	29.59	253.93
32.00	395.3	32.00	204.2	32.07	202.3	32.02	267.27
34.48	413.4	34.48	213.2	34.48	215.5	34.48	280.70
34.48	409.2	34.48	213.8	34.48	213.4	34.48	278.80
32.69	388.4	32.69	203.6	32.69	204	32.69	265.33
30.83	365.3	30.90	192	30.83	195	30.85	250.77
29.03	347.2	29.03	182	29.03	186	29.03	238.40
27.24	325.5	27.24	175	27.24	174.2	27.24	224.90
25.45	306.5	25.45	163.9	25.45	166.5	25.45	212.30
23.66	287.7	23.66	155.9	23.66	155.6	23.66	199.73
21.86	269.9	21.86	144.4	21.86	148.2	21.86	187.50
20.00	249.8	20.07	135.2	20.07	137.9	20.05	174.30
18.21	234.5	18.28	127.3	18.21	128.1	18.23	163.30
16.41	215.3	16.41	117.4	16.41	118	16.41	150.23
14.62	193.3	14.62	105.8	14.62	108.7	14.62	135.93
12.83	174.8	12.83	96.35	12.83	98.66	12.83	123.27
11.03	154.6	11.03	86.28	11.03	87.53	11.03	109.47
9.24	135	9.24	75.95	9.24	77.89	9.24	96.28
7.45	114.3	7.45	65.18	7.45	66.74	7.45	82.07
5.59	94.82	5.60	55.31	5.61	55.83	5.60	68.65
3.81	72.65	3.81	44	3.81	44.43	3.81	53.69
1.99	49.25	2.01	31.84	2.02	31.96	2.01	37.68
0.20	24.22	0.21	18.55	0.20	18.41	0.20	20.39

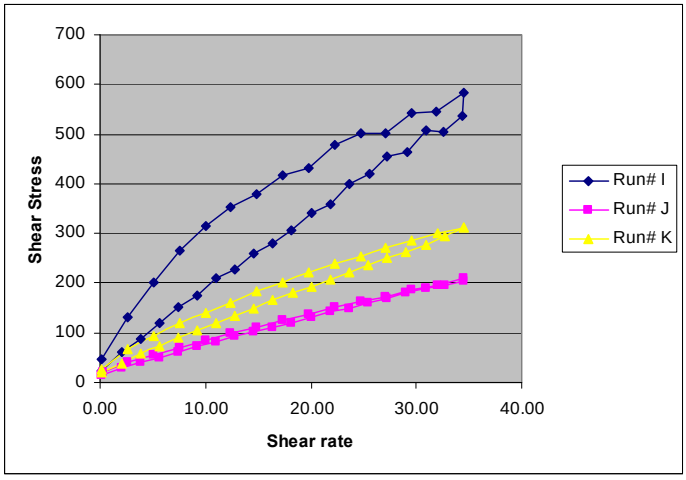
				Average	Stdev
YS	31.2	23.2	24.1	26.1	4.4
VS	10.9	5.6	5.6	7.4	3.1
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	1521	266	94	627	779



Set E7: CS-BX5 – BL36- L2– 7 day – NIST code (folder SR 55-SR-52D)

SR-52D							
Run# I		Run# J		Run# K		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	46.02	0.21	20.42	0.20	27.35	0.20	31.26
2.64	132.1	2.65	40.45	2.65	66.73	2.65	79.76
5.10	200.1	5.08	55.92	5.10	93.11	5.10	116.38
7.52	264.8	7.59	70.01	7.52	119.5	7.54	151.44
10.00	314.1	10.00	84.32	10.00	141	10.00	179.81
12.41	353.6	12.41	98.21	12.41	161.6	12.41	204.47
14.90	377.9	14.90	110.9	14.90	183	14.90	223.93
17.31	416.2	17.31	125.1	17.31	202.1	17.31	247.80
19.79	432.6	19.79	137.2	19.79	221.3	19.79	263.70
22.28	476.9	22.21	151.7	22.28	237.8	22.25	288.80
24.69	500.9	24.69	164	24.69	254.7	24.69	306.53
27.10	502.7	27.10	173.2	27.10	272.1	27.10	316.00
29.59	541.6	29.59	186.8	29.59	286.6	29.59	338.33
31.93	546.2	32.00	195.6	32.00	300.5	31.98	347.43
34.48	583.7	34.48	210.4	34.48	312.7	34.48	368.93
34.41	536.4	34.48	204.2	34.48	310.8	34.46	350.47
32.62	505.9	32.69	194.4	32.69	294.9	32.67	331.73
30.90	508.4	30.90	189.8	30.90	278.4	30.90	325.53
29.10	464.7	29.03	179.8	29.03	263.5	29.06	302.67
27.24	453.9	27.24	168.8	27.24	251.5	27.24	291.40
25.52	421.3	25.45	161	25.45	235.8	25.47	272.70
23.66	400.1	23.66	150.2	23.66	222.9	23.66	257.73
21.86	359.5	21.86	141.8	21.86	207	21.86	236.10
20.07	341	20.07	132.6	20.07	193.4	20.07	222.33
18.21	305.2	18.21	119.7	18.28	180.1	18.23	201.67
16.41	281	16.41	110.3	16.41	165.6	16.41	185.63
14.62	259.4	14.62	103.3	14.62	149.8	14.62	170.83
12.83	226.4	12.83	92.76	12.83	135.4	12.83	151.52
11.03	210.7	11.03	83.05	11.03	120.7	11.03	138.15
9.24	174.1	9.24	72.79	9.24	104.9	9.24	117.26
7.45	151.6	7.45	62.54	7.45	89.43	7.45	101.19
5.61	118.2	5.61	50.46	5.61	73.64	5.61	80.77
3.81	88.91	3.81	39.7	3.82	57.05	3.81	61.89
2.01	60.5	2.01	28.62	2.01	39.21	2.01	42.78
0.20	23.81	0.19	15.45	0.20	19.53	0.20	19.60

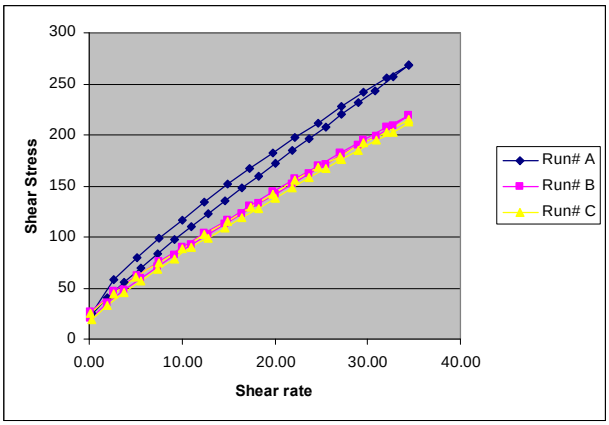
				Average	Stdev
YS	34.8	20.3	26.2	27.1	7.3
VS	15.0	5.5	8.3	9.6	4.9
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	1410	17	748	725	697



Set F1: CS-BX1 – BL33- L1 – Mixing Day – NIST code (folder SR 57-SR-56A)

SR-56A							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.24	25.02	0.20	26.72	0.21	25.21	0.22	25.65
2.63	58.61	2.65	46.35	2.64	44.67	2.64	49.88
5.10	79.75	5.10	61.56	5.08	60.55	5.09	67.29
7.52	99.07	7.52	75.38	7.52	74.84	7.52	83.10
10.00	116.6	10.00	89.47	10.00	88.78	10.00	98.28
12.41	133.8	12.41	103.2	12.41	102.5	12.41	113.17
14.90	151.4	14.90	117	14.90	115.6	14.90	128.00
17.31	166.5	17.31	130.9	17.38	128.9	17.33	142.10
19.79	182.7	19.79	144.4	19.79	141.4	19.79	156.17
22.21	197.1	22.21	157	22.21	155.3	22.21	169.80
24.69	211.9	24.69	169.8	24.69	167.8	24.69	183.17
27.17	227.7	27.10	182.9	27.10	178.6	27.13	196.40
29.59	241.3	29.59	194.7	29.59	192	29.59	209.33
32.00	255.8	32.00	207.3	32.00	202.4	32.00	221.83
34.48	268.4	34.48	218.4	34.48	215.4	34.48	234.07
34.48	268.6	34.48	218.6	34.48	212.5	34.48	233.23
32.69	256.6	32.69	209	32.69	202.8	32.69	222.80
30.83	243.2	30.90	198.8	30.90	194.9	30.87	212.30
29.03	232.2	29.03	189.7	29.03	184.8	29.03	202.23
27.24	219.7	27.24	180.7	27.24	176.3	27.24	192.23
25.45	207.8	25.45	171.1	25.45	166.9	25.45	181.93
23.66	195.6	23.66	161.8	23.66	157.8	23.66	171.73
21.86	184.5	21.86	152.1	21.86	147.5	21.86	161.37
20.07	171.9	20.07	142.4	20.07	138.5	20.07	150.93
18.28	159.9	18.28	133.1	18.28	127.9	18.28	140.30
16.41	147.7	16.41	123.1	16.41	118.4	16.41	129.73
14.62	135.3	14.62	112.6	14.62	109	14.62	118.97
12.83	123.1	12.83	102.9	12.83	98.76	12.83	108.25
11.03	109.6	11.03	91.99	11.03	89.31	11.03	96.97
9.24	97.21	9.24	81.7	9.24	78.2	9.24	85.70
7.38	83.28	7.38	70.26	7.45	67.96	7.40	73.83
5.61	69.57	5.60	59.2	5.61	56.6	5.61	61.79
3.82	55.43	3.83	47.64	3.80	45.23	3.82	49.43
2.02	40.05	2.00	34.83	2.01	33.47	2.01	36.12
0.21	22.55	0.20	20.31	0.21	19.36	0.21	20.74

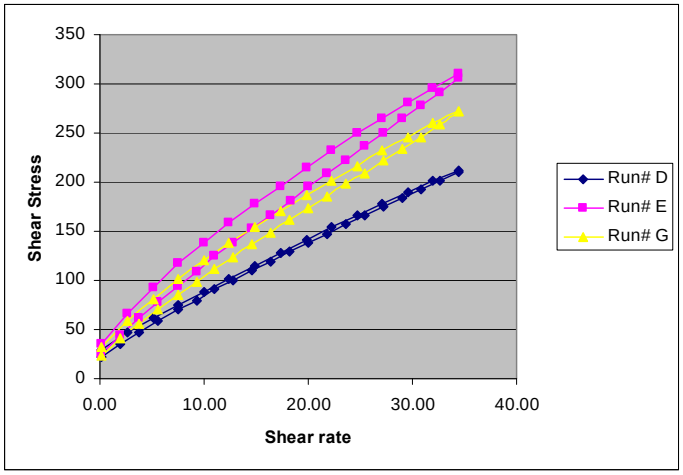
					Average	Stdev
YS	29.6		27.2		25.4	27.4	2.1
VS	7.0		5.6		5.5	6.1	0.8
R2	1.0		1.0		1.0	1.0	0.0
Hysteresis	369		124		76	190	157



Set F1: CS-BX1 – BL6- L2 – Mixing Day – NIST code (folder SR 57-SR-56B)

SR-56B							
Run# D		Run# E		Run# G		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	28.77	0.21	35.43	0.20	32.33	0.20	32.18
2.65	46.8	2.65	65.97	2.65	58.15	2.65	56.97
5.09	61.53	5.10	92.14	5.10	80.68	5.09	78.12
7.52	74.96	7.52	117.9	7.52	102.2	7.52	98.35
10.00	88.17	10.00	138.3	10.00	120.6	10.00	115.69
12.41	101.6	12.41	158.5	12.41	137.8	12.41	132.63
14.90	114.9	14.90	178.1	14.90	154.5	14.90	149.17
17.31	128.2	17.31	196.3	17.31	170.9	17.31	165.13
19.79	141	19.79	214.6	19.79	187.3	19.79	180.97
22.21	153.9	22.21	232.9	22.21	202.2	22.21	196.33
24.69	166.1	24.69	249.8	24.69	216.9	24.69	210.93
27.10	177.7	27.10	265.2	27.10	232.4	27.10	225.10
29.59	189.7	29.59	281.3	29.59	246.3	29.59	239.10
32.00	200.9	32.00	294.9	32.00	260.3	32.00	252.03
34.48	212.3	34.48	310.7	34.48	272.7	34.48	265.23
34.48	211	34.48	305.5	34.48	271.7	34.48	262.73
32.69	201.6	32.69	290.7	32.69	258.8	32.69	250.37
30.90	193.3	30.83	278.6	30.90	245.6	30.87	239.17
29.03	183.7	29.03	264.4	29.03	233.3	29.03	227.13
27.24	175.2	27.24	250.4	27.24	222.4	27.24	216.00
25.45	166.1	25.45	237.2	25.45	209.5	25.45	204.27
23.66	157.1	23.66	222.7	23.66	198.2	23.66	192.67
21.86	147.3	21.86	209.4	21.86	185.3	21.86	180.67
20.07	138.6	20.00	195.7	20.07	173.5	20.05	169.27
18.21	129.2	18.28	180.3	18.21	161.3	18.23	156.93
16.41	119.7	16.41	166.3	16.41	149	16.41	145.00
14.62	110	14.62	153.4	14.62	136.4	14.62	133.27
12.83	99.79	12.83	138.3	12.83	123.6	12.83	120.56
11.03	90.62	11.03	124.3	11.03	111.4	11.03	108.77
9.24	79.83	9.24	109.1	9.24	97.83	9.24	95.59
7.45	69.99	7.45	94.24	7.45	84.81	7.45	83.01
5.61	58.68	5.59	77.69	5.61	70.48	5.60	68.95
3.80	47.21	3.81	61.46	3.81	56.27	3.80	54.98
2.01	35.8	1.99	44.5	1.99	41.24	2.00	40.51
0.20	21.98	0.20	24.96	0.20	23.92	0.20	23.62

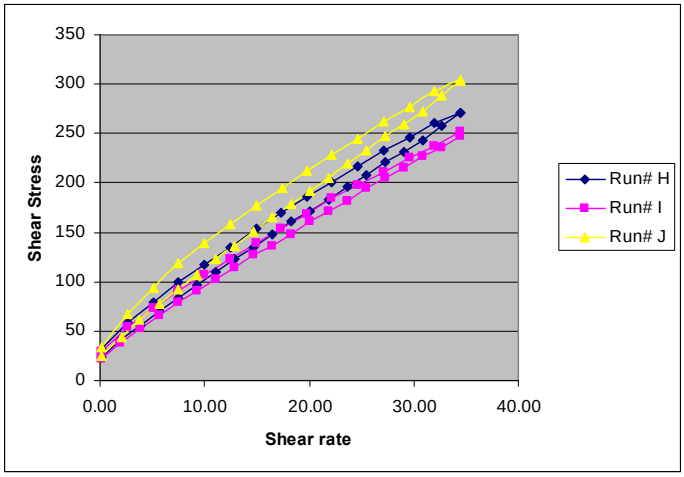
					Average	Stdev
YS	28.2		32.3	30.5	30.3	2.1
VS	5.4		8.0	7.1	6.8	1.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	95		442	410	316	192



Set F1: CS-BX1 – BL33- L2 – Mixing Day – NIST code (folder SR 57-SR-56C)

SR-56C							
Run# H		Run# I		Run# J		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	32.11	0.20	28.81	0.20	33.45	0.20	31.46
2.65	58.7	2.64	53.48	2.64	67.66	2.64	59.95
5.10	79.32	5.10	73.04	5.08	93.37	5.09	81.91
7.52	99.52	7.52	91.18	7.52	118.9	7.52	103.20
10.00	117.6	10.00	107	10.00	138.8	10.00	121.13
12.41	135	12.41	123.3	12.41	157.8	12.41	138.70
14.90	153.3	14.90	138.8	14.90	177.3	14.90	156.47
17.31	169.8	17.31	154	17.38	195.4	17.33	173.07
19.79	186.7	19.79	168.9	19.79	212.9	19.79	189.50
22.21	201.1	22.21	183.8	22.21	228.5	22.21	204.47
24.69	216.2	24.69	198.1	24.69	244.8	24.69	219.70
27.10	232.4	27.10	211.3	27.10	262.1	27.10	235.27
29.59	245.7	29.59	225.5	29.59	277.3	29.59	249.50
32.00	260.4	32.00	237.9	32.00	292.4	32.00	263.57
34.48	270.3	34.48	251.3	34.48	304.3	34.48	275.30
34.48	270.8	34.48	247.6	34.48	303.5	34.48	273.97
32.69	258.1	32.69	235.9	32.62	288.7	32.67	260.90
30.83	243.3	30.83	227	30.90	272.9	30.85	247.73
29.03	231.4	29.10	215.7	29.03	258.8	29.06	235.30
27.24	220.7	27.24	204.4	27.24	247.4	27.24	224.17
25.45	207.7	25.45	194.1	25.45	232.6	25.45	211.47
23.66	196.7	23.66	182.2	23.66	220.3	23.66	199.73
21.86	183.7	21.86	171.9	21.86	205.1	21.86	186.90
20.00	171.6	20.00	160.8	20.07	192	20.02	174.80
18.21	160.8	18.28	147.9	18.21	179.1	18.23	162.60
16.41	148.5	16.41	136.6	16.41	165.6	16.41	150.23
14.62	135.1	14.62	126.7	14.62	150.6	14.62	137.47
12.83	122.7	12.83	114.9	12.83	136	12.83	124.53
11.03	110.1	11.03	102.9	11.03	122.8	11.03	111.93
9.24	96.93	9.24	91.04	9.24	107.2	9.24	98.39
7.45	83.62	7.45	78.62	7.45	92.93	7.45	85.06
5.61	70.08	5.61	65.39	5.61	77.41	5.61	70.96
3.81	55.9	3.81	52.39	3.80	60.93	3.81	56.41
2.00	40.79	1.99	38.46	2.01	44.33	2.00	41.19
0.19	23.46	0.21	22.48	0.21	24.76	0.20	23.57

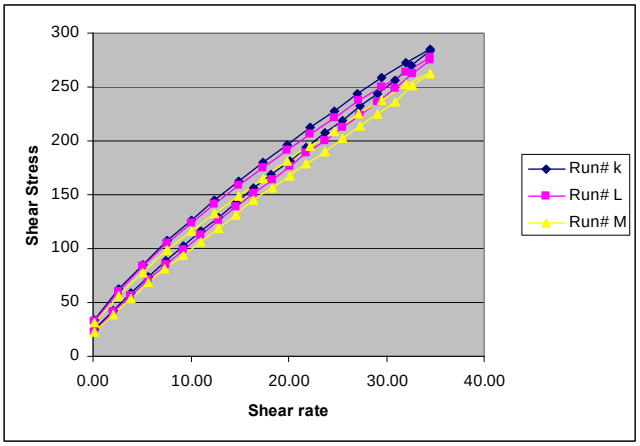
				Average	Stdev
YS	29.9	29.0	31.9	30.3	1.5
VS	7.0	6.4	7.9	7.1	0.7
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	461	193	620	425	216



Set F1: CS-BX1 – BL6- L1 – Mixing Day – NIST code (folder SR 57-SR-56D)

SR-56D							
Run# k		Run# L		Run# M		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	33.46	0.19	32.25	0.20	31.53	0.20	32.41
2.64	62.22	2.64	60.28	2.64	55.92	2.64	59.47
5.08	85.29	5.10	83.44	5.10	77.81	5.09	82.18
7.52	108	7.52	105.3	7.52	98.84	7.52	104.05
10.00	126.6	10.00	124	10.00	116.6	10.00	122.40
12.41	144.6	12.41	141.4	12.41	133.1	12.41	139.70
14.90	162.3	14.90	158.7	14.90	149.3	14.90	156.77
17.38	179.8	17.31	175.3	17.31	165.4	17.33	173.50
19.79	196.1	19.79	191.4	19.79	180.7	19.79	189.40
22.21	211.9	22.21	206.6	22.21	194.8	22.21	204.43
24.69	227.6	24.69	221.5	24.69	209	24.69	219.37
27.10	243.6	27.17	236.9	27.17	224.9	27.15	235.13
29.59	258.8	29.59	250.3	29.59	237.8	29.59	248.97
32.00	272.9	32.00	264.3	32.00	251.9	32.00	263.03
34.48	285.2	34.48	276.9	34.48	262.7	34.48	274.93
34.48	283.2	34.48	275	34.48	263.1	34.48	273.77
32.62	269.5	32.69	262.1	32.69	250.7	32.67	260.77
30.90	256.8	30.83	249	30.90	236.8	30.87	247.53
29.03	243.3	29.03	236.8	29.03	224.8	29.03	234.97
27.24	232.7	27.24	224.1	27.24	214.3	27.24	223.70
25.45	219.2	25.45	212.5	25.45	201.9	25.45	211.20
23.66	207.5	23.66	200.1	23.66	190.6	23.66	199.40
21.86	193.3	21.86	188.2	21.86	178.5	21.86	186.67
20.07	181.1	20.07	175.9	20.07	167	20.07	174.67
18.21	168.8	18.28	163.9	18.28	156.5	18.25	163.07
16.41	156.1	16.41	151.2	16.41	144.4	16.41	150.57
14.62	142.4	14.62	138.3	14.62	131.1	14.62	137.27
12.83	128.8	12.83	125.8	12.83	119.3	12.83	124.63
11.03	116.6	11.03	112.4	11.03	106.7	11.03	111.90
9.24	101.9	9.24	99.37	9.24	94.08	9.24	98.45
7.45	88.62	7.45	85.13	7.38	80.88	7.43	84.88
5.61	73.54	5.61	71.22	5.61	68.16	5.61	70.97
3.81	58.16	3.82	56.62	3.81	54.24	3.81	56.34
2.01	42.96	2.01	40.75	2.01	39.05	2.01	40.92
0.20	24.45	0.20	23.07	0.19	22.68	0.20	23.40

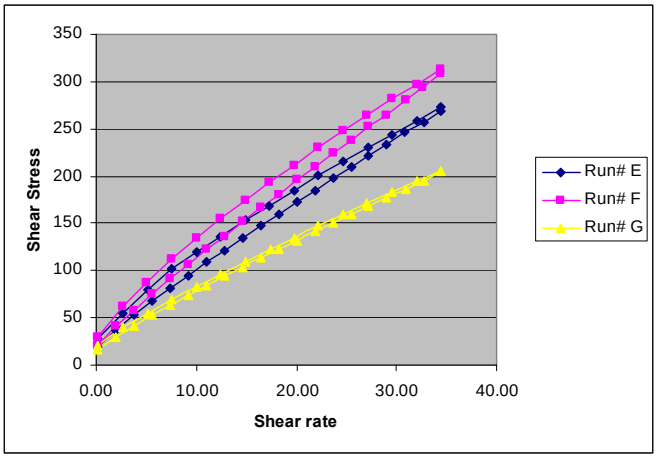
					Average	Stdev
YS	31.6		30.3	28.9	30.3	1.4
VS	7.4		7.2	6.8	7.1	0.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	428		440	451	440	12



Set F3: CS-BX1 – BL33- L1 – 3 day – NIST code (folder SR 58-SR-56A)

SR-56A							
Run# E		Run# F		Run# G		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	27.68	0.20	29.37	0.20	21.24	0.20	26.10
2.63	55.17	2.65	61.98	2.65	39.63	2.64	52.26
5.10	79.2	5.08	87.81	5.10	54.73	5.09	73.91
7.52	102.1	7.59	112.5	7.59	68.7	7.56	94.43
10.00	119.1	10.00	134.4	10.00	82.35	10.00	111.95
12.41	136	12.41	154.9	12.41	95.44	12.41	128.78
14.90	153.3	14.90	174.1	14.90	108.7	14.90	145.37
17.31	169	17.31	193.7	17.38	121.9	17.33	161.53
19.79	185.2	19.79	211.7	19.79	135	19.79	177.30
22.21	200.4	22.21	230.6	22.21	147.1	22.21	192.70
24.69	215.7	24.69	248.3	24.69	159.7	24.69	207.90
27.17	230.4	27.10	264.4	27.10	171.5	27.13	222.10
29.59	244	29.59	282.5	29.59	183.3	29.59	236.60
32.00	257.8	32.00	297	32.00	194.5	32.00	249.77
34.48	273.3	34.48	312.4	34.48	205.6	34.48	263.77
34.48	269.4	34.48	308.7	34.48	204.8	34.48	260.97
32.69	256.6	32.62	293.6	32.69	195.5	32.67	248.57
30.83	246.9	30.90	280.3	30.90	186.7	30.87	237.97
29.03	234	29.03	265	29.03	177.4	29.03	225.47
27.24	222.1	27.24	253.1	27.24	168.7	27.24	214.63
25.45	209.5	25.45	238.3	25.45	159.5	25.45	202.43
23.66	198	23.66	225	23.66	150.7	23.66	191.23
21.86	184.3	21.86	209	21.86	141.5	21.86	178.27
20.07	172.4	20.07	195.8	20.00	132	20.05	166.73
18.28	159.9	18.21	180.9	18.21	123.2	18.23	154.67
16.41	147.7	16.41	166.9	16.41	113.8	16.41	142.80
14.62	134.6	14.62	151.6	14.62	103.8	14.62	130.00
12.83	121.4	12.83	136.3	12.83	94.23	12.83	117.31
11.03	109.2	11.03	123	11.03	84.1	11.03	105.43
9.24	95.14	9.24	106.2	9.24	74.23	9.24	91.86
7.45	81.87	7.45	91.6	7.45	63.65	7.45	79.04
5.60	67.63	5.61	75.13	5.61	53.1	5.61	65.29
3.81	52.99	3.79	58.22	3.80	41.92	3.80	51.04
2.01	37.65	2.01	41.13	2.01	30.11	2.01	36.30
0.20	19.93	0.20	20.73	0.19	16.57	0.20	19.08

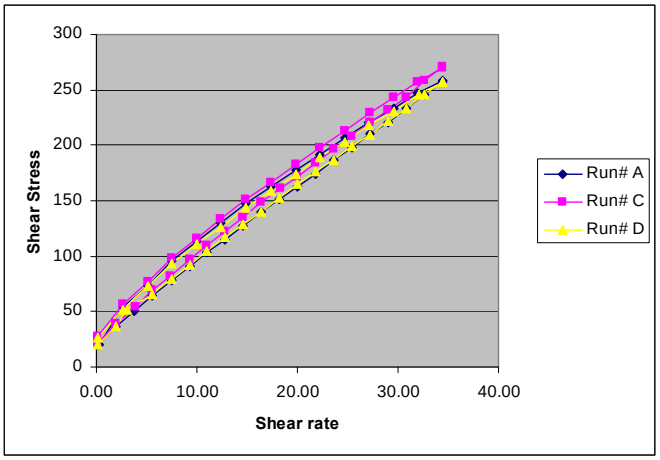
					Average	Stdev
YS	26.9		28.2	22.6	25.9	3.0
VS	7.2		8.2	5.4	6.9	1.4
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	303		425	97	275	166



Set F3: CS-BX1 – BL6- L2 – 3 day – NIST code (folder SR 58-SR-56B)

SR-56B							
Run# A		Run# C		Run# D		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.26	20.61	0.20	27.79	0.20	26.4	0.22	24.93
2.65	53.74	2.64	56.62	2.63	52.06	2.64	54.14
5.10	73.72	5.10	77.13	5.09	72.68	5.10	74.51
7.52	96.08	7.52	98.18	7.52	92.88	7.52	95.71
10.00	113	10.00	116.5	10.00	110.3	10.00	113.27
12.41	129.9	12.41	133.4	12.41	126.6	12.41	129.97
14.90	146.9	14.90	150.8	14.90	143.2	14.90	146.97
17.31	162.3	17.31	166.9	17.31	158.9	17.31	162.70
19.79	177.8	19.79	183.3	19.79	174.3	19.79	178.47
22.21	191.9	22.21	197.9	22.21	188.6	22.21	192.80
24.69	206.2	24.69	212.9	24.69	203	24.69	207.37
27.10	220.8	27.17	229.3	27.10	218.2	27.13	222.77
29.59	233.8	29.59	242.7	29.59	231.2	29.59	235.90
32.00	247	32.00	257.7	32.07	245.7	32.02	250.13
34.48	258.7	34.48	269.7	34.48	257.5	34.48	261.97
34.48	257.4	34.48	270.5	34.48	257.1	34.48	261.67
32.69	245.2	32.69	257.8	32.69	245.4	32.69	249.47
30.83	232.6	30.90	243.7	30.83	233.4	30.85	236.57
29.03	220.7	29.03	231.5	29.03	222.3	29.03	224.83
27.24	210.3	27.24	220.3	27.24	209.6	27.24	213.40
25.45	198.2	25.45	207.7	25.45	199.4	25.45	201.77
23.66	187.1	23.66	196.2	23.66	187.1	23.66	190.13
21.86	174.5	21.86	184	21.86	176.7	21.86	178.40
20.07	163.2	20.07	171.9	20.07	165	20.07	166.70
18.21	151.6	18.28	160.9	18.21	152.4	18.23	154.97
16.41	139.6	16.41	148.3	16.41	140.5	16.41	142.80
14.62	127.5	14.62	134.9	14.62	129.2	14.62	130.53
12.83	115.1	12.83	122.8	12.83	116.9	12.83	118.27
11.03	103.4	11.03	109.5	11.03	104.6	11.03	105.83
9.24	90.33	9.24	96.43	9.24	91.79	9.24	92.85
7.45	78.05	7.38	82.51	7.45	78.85	7.43	79.80
5.61	64.14	5.61	69.29	5.61	65.07	5.61	66.17
3.81	50.5	3.83	54.64	3.05	51.1	3.56	52.08
1.99	36.24	2.01	38.65	2.01	36.56	2.01	37.15
0.20	19.69	0.19	21.12	0.20	19.82	0.20	20.21

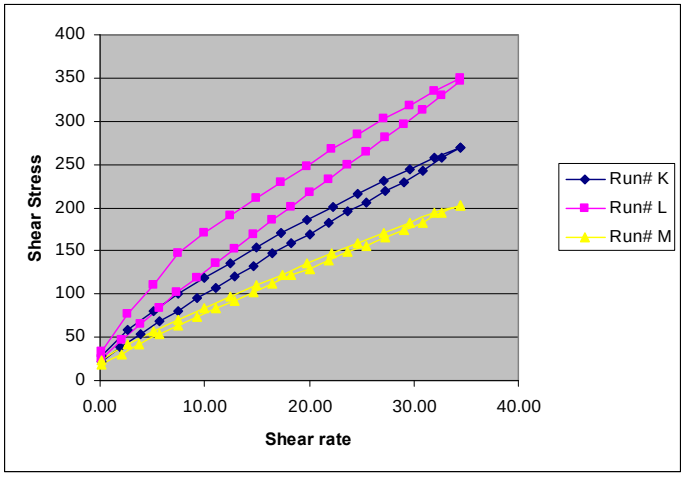
				Average	Stdev
YS	25.7	28.6	27.6	27.3	1.4
VS	6.8	7.1	6.7	6.9	0.2
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	403	401	313	372	52



Set F3: CS-BX1 – BL33- L2 – 3 day – NIST code (folder SR 58-SR-56C)

SR-56C							
Run# K		Run# L		Run# M		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.21	28.42	0.20	33.57	0.20	23.35	0.20	28.45
2.65	58.79	2.64	77.55	2.65	42.11	2.65	59.48
5.10	80.44	5.10	111.2	5.10	56.62	5.10	82.75
7.52	99.87	7.52	147.1	7.52	69.93	7.52	105.63
10.00	118.5	10.00	170.5	10.00	83.74	10.00	124.25
12.41	136.3	12.41	191	12.41	97.04	12.41	141.45
14.90	153.7	14.90	211.1	14.90	110	14.90	158.27
17.31	170.6	17.31	229.7	17.38	122.8	17.33	174.37
19.79	185.9	19.79	248.3	19.79	135.4	19.79	189.87
22.28	200.9	22.21	267	22.21	147	22.23	204.97
24.69	215.2	24.69	284.9	24.69	158.7	24.69	219.60
27.10	230.7	27.10	302.2	27.10	170.8	27.10	234.57
29.59	244.8	29.59	318.6	29.59	182	29.59	248.47
32.00	258.4	32.00	334.6	32.00	193.4	32.00	262.13
34.48	269	34.48	350.1	34.48	202.7	34.48	273.93
34.48	270	34.48	346.6	34.48	203	34.48	273.20
32.69	257.1	32.69	329.3	32.62	193.7	32.67	260.03
30.90	241.9	30.90	312.2	30.90	182.9	30.90	245.67
29.03	230	29.03	296.1	29.03	173.8	29.03	233.30
27.24	219.4	27.24	280.8	27.24	166.4	27.24	222.20
25.45	205.5	25.45	264.3	25.45	156.3	25.45	208.70
23.66	195.1	23.66	249	23.66	148.5	23.66	197.53
21.86	182.1	21.86	232.6	21.86	138.4	21.86	184.37
20.07	169.5	20.07	216.9	20.07	129.2	20.07	171.87
18.28	159.4	18.28	201.2	18.21	121.5	18.25	160.70
16.41	146.9	16.41	185.2	16.41	112.2	16.41	148.10
14.62	132.9	14.62	168.8	14.62	101.5	14.62	134.40
12.83	120.8	12.83	152.4	12.83	92.53	12.83	121.91
11.03	107.2	11.03	135.8	11.03	82.87	11.03	108.62
9.24	94.85	9.24	118.9	9.24	72.97	9.24	95.57
7.45	80.89	7.38	101.6	7.45	62.94	7.43	81.81
5.61	67.96	5.61	83.92	5.61	53.24	5.61	68.37
3.82	53.65	3.81	65.62	3.79	42.4	3.81	53.89
2.01	38.02	2.01	46.16	2.02	30.74	2.01	38.31
0.20	21.05	0.19	24.33	0.20	18.04	0.20	21.14

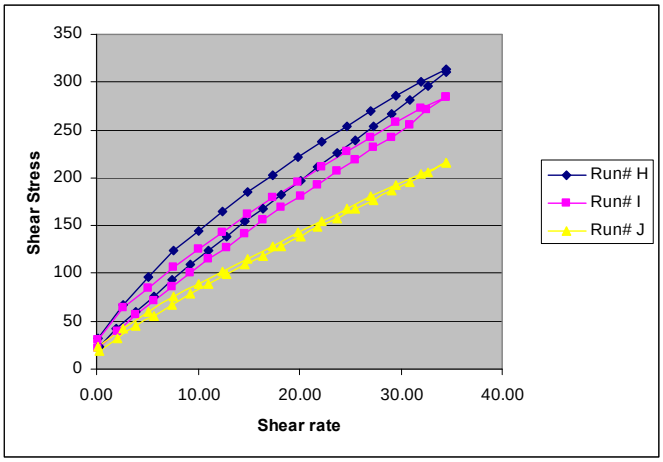
				Average	Stdev
YS	27.2	31.4	22.9	27.2	4.3
VS	7.1	9.2	5.3	7.2	2.0
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	535	894	210	546	342



Set F3: CS-BX1 – BL6- L1 – 3 day – NIST code (folder SR 58-SR-56D)

SR-56D							
Run# H		Run# I		Run# J		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	31.37	0.19	30.4	0.20	23.54	0.20	28.44
2.65	67.72	2.66	64.05	2.63	42.71	2.64	58.16
5.10	96	5.09	85.09	5.10	60.03	5.10	80.37
7.52	123.4	7.52	106	7.52	75.19	7.52	101.53
10.00	144.8	10.00	125.3	10.00	88.59	10.00	119.56
12.41	165.3	12.41	143.4	12.41	101.8	12.41	136.83
14.90	185.3	14.90	161.5	14.90	115.8	14.90	154.20
17.31	203.1	17.38	179.3	17.31	129	17.33	170.47
19.79	221.1	19.79	195.3	19.79	142.5	19.79	186.30
22.21	237.5	22.28	211.2	22.21	155.2	22.23	201.30
24.69	253.8	24.69	227.1	24.69	167.7	24.69	216.20
27.10	270.1	27.10	242.7	27.10	180.5	27.10	231.10
29.59	285.2	29.59	258	29.59	192.2	29.59	245.13
32.00	300.3	32.00	272.6	32.00	204.3	32.00	259.07
34.48	314.1	34.48	284.7	34.48	215.8	34.48	271.53
34.48	310.7	34.48	284.4	34.48	215.4	34.48	270.17
32.69	295.8	32.62	270.6	32.69	205.6	32.67	257.33
30.90	281.7	30.90	255.8	30.90	195.8	30.90	244.43
29.03	267.5	29.03	242.5	29.03	186.4	29.03	232.13
27.24	253.9	27.24	232.4	27.24	176.4	27.24	220.90
25.45	239.8	25.45	218.4	25.45	167.4	25.45	208.53
23.66	225.8	23.66	207.2	23.66	157.5	23.66	196.83
21.86	211.5	21.86	192.7	21.86	148.5	21.86	184.23
20.07	197.3	20.07	180.2	20.07	138.7	20.07	172.07
18.21	182.8	18.21	168.6	18.21	128.7	18.21	160.03
16.41	168.3	16.41	155.6	16.41	118.8	16.41	147.57
14.62	154.1	14.62	140.8	14.62	109	14.62	134.63
12.83	139.1	12.83	127.5	12.83	98.97	12.83	121.86
11.03	124.2	11.03	114.5	11.03	88.54	11.03	109.08
9.24	108.7	9.24	99.96	9.24	78.18	9.24	95.61
7.45	93.09	7.45	86.18	7.45	67.29	7.45	82.19
5.61	76.49	5.61	71.71	5.61	56.01	5.61	68.07
3.81	59.9	3.81	56.23	3.82	44.74	3.81	53.62
1.99	42.34	2.01	40.1	2.01	32.6	2.01	38.35
0.21	22.62	0.20	21.69	0.21	18.95	0.20	21.09

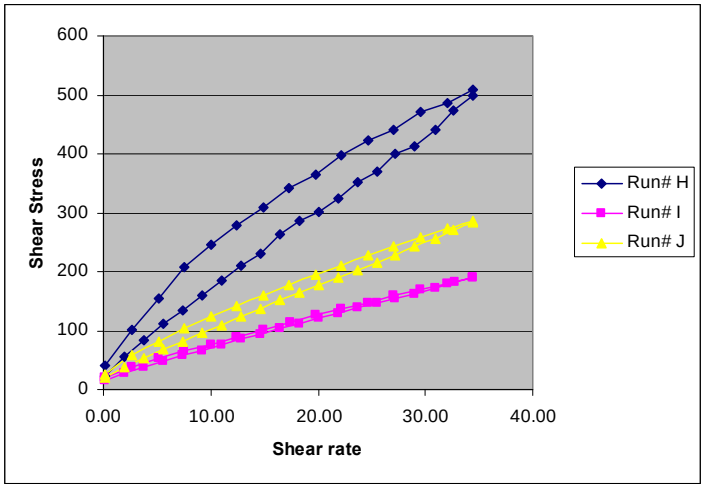
					Average	Stdev
YS	30.0		28.9	24.3	27.7	3.0
VS	8.2		7.5	5.6	7.1	1.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	626		499	156	427	243



Set F7: CS-BX1 – BL33- L1 – 7 day – NIST code (folder SR 59-SR-56A)

SR-56A							
Run# H		Run# I		Run# J		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	39.64	0.20	20.4	0.20	25.97	0.20	28.67
2.64	101.2	2.64	38.22	2.65	58.06	2.64	65.83
5.10	153.2	5.09	52.12	5.09	80.16	5.09	95.16
7.52	207.2	7.59	64.83	7.59	102.8	7.56	124.94
10.00	244.5	10.00	77.08	10.00	123.6	10.00	148.39
12.41	279.5	12.41	89.28	12.41	142.1	12.41	170.29
14.90	308.2	14.90	101.7	14.90	160.5	14.90	190.13
17.31	341.6	17.38	113.4	17.31	178	17.33	211.00
19.79	365	19.79	125.4	19.79	195.2	19.79	228.53
22.21	398.4	22.21	136.5	22.21	210.9	22.21	248.60
24.69	423.9	24.69	147.6	24.69	227.1	24.69	266.20
27.10	440.2	27.10	159.3	27.10	243.4	27.10	280.97
29.59	469.9	29.59	169.9	29.59	258.3	29.59	299.37
32.00	486	32.07	180.7	32.00	273	32.02	313.23
34.48	507.6	34.48	190.1	34.48	285.3	34.48	327.67
34.48	498.6	34.48	190.4	34.48	284.1	34.48	324.37
32.62	473.4	32.69	181.6	32.62	270.1	32.64	308.37
30.90	439.7	30.90	171.9	30.90	255.5	30.90	289.03
29.03	413.8	29.03	163.2	29.03	242.1	29.03	273.03
27.24	400.2	27.24	155.5	27.24	229.1	27.24	261.60
25.45	369.4	25.45	146.4	25.45	215.9	25.45	243.90
23.66	353.1	23.66	138.4	23.66	203.2	23.66	231.57
21.86	323	21.86	129.1	21.86	189.9	21.86	214.00
20.07	300.8	20.07	120.6	20.07	176.8	20.07	199.40
18.21	285.2	18.21	112.6	18.21	164.4	18.21	187.40
16.41	262.2	16.41	103.8	16.41	151.2	16.41	172.40
14.62	231.6	14.62	94.23	14.62	136.8	14.62	154.21
12.83	208.9	12.83	85.23	12.83	123.7	12.83	139.28
11.03	185.1	11.03	76.44	11.03	110	11.03	123.85
9.24	160.1	9.24	66.89	9.24	96.22	9.24	107.74
7.38	135	7.45	57.67	7.45	81.92	7.43	91.53
5.60	111.3	5.60	48.3	5.61	68.05	5.60	75.88
3.82	83.84	3.79	38.06	3.79	52.88	3.80	58.26
2.01	54.99	2.02	27.52	2.01	36.9	2.01	39.80
0.20	23	0.20	15.69	0.21	19.02	0.20	19.24

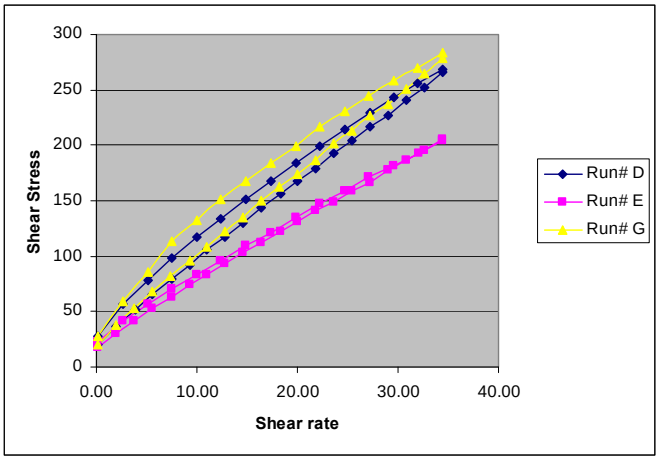
					Average	Stdev
YS	33.0		19.6	24.4	25.7	6.8
VS	13.4		5.0	7.6	8.7	4.3
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	1574		187	523	761	724



Set F7: CS-BX1 – BL6- L2 – 7 day – NIST code (folder SR 59-SR-56B)

SR-56B							
Run# D		Run# E		Run# G		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.19	28.04	0.21	22.52	0.20	27.98	0.20	26.18
2.65	56.67	2.65	41.75	2.64	59.57	2.65	52.66
5.10	78.14	5.10	56.82	5.10	85.73	5.10	73.56
7.52	98.19	7.52	70.5	7.52	113.6	7.52	94.10
10.00	116.6	10.00	83.43	10.00	132.9	10.00	110.98
12.41	134.2	12.41	96.3	12.41	150.8	12.41	127.10
14.90	151.7	14.90	109.5	14.90	167.4	14.90	142.87
17.38	167.9	17.38	121.5	17.31	184.5	17.36	157.97
19.79	184.1	19.79	134.8	19.79	199.7	19.79	172.87
22.21	199.3	22.21	147	22.21	216.5	22.21	187.60
24.69	214.1	24.69	159.1	24.69	231.1	24.69	201.43
27.17	229.3	27.10	170.9	27.10	244	27.13	214.73
29.59	243.2	29.59	181.6	29.59	259	29.59	227.93
32.00	256.3	32.07	193.4	32.00	270	32.02	239.90
34.48	268.4	34.48	205.4	34.48	283.6	34.48	252.47
34.48	265.7	34.48	204.6	34.48	278.9	34.48	249.73
32.69	252.6	32.69	195.4	32.69	265.1	32.69	237.70
30.90	240.3	30.83	186.4	30.90	250.8	30.87	225.83
29.03	227.3	29.03	177.7	29.03	237.4	29.03	214.13
27.24	216.7	27.24	166.5	27.24	227.4	27.24	203.53
25.45	203.7	25.45	158.7	25.45	212.4	25.45	191.60
23.66	192.3	23.66	148.4	23.66	201.4	23.66	180.70
21.86	179	21.86	141.1	21.86	186.4	21.86	168.83
20.07	167.4	20.07	131.4	20.07	174	20.07	157.60
18.28	155.7	18.28	122.2	18.21	162.7	18.25	146.87
16.41	143.5	16.41	112.7	16.41	149.8	16.41	135.33
14.62	130.4	14.62	103.4	14.62	135.2	14.62	123.00
12.83	117.6	12.83	93.84	12.83	122.1	12.83	111.18
11.03	105.8	11.03	83.54	11.03	109	11.03	99.45
9.24	92.19	9.24	73.94	9.24	95.34	9.24	87.16
7.45	79.19	7.45	63.62	7.38	81.4	7.43	74.74
5.60	65.88	5.61	53.14	5.60	67.76	5.60	62.26
3.83	51.76	3.79	42.03	3.81	52.94	3.81	48.91
2.01	36.86	2.01	30.41	2.01	37.25	2.01	34.84
0.20	20.07	0.20	17.48	0.20	20.11	0.20	19.22

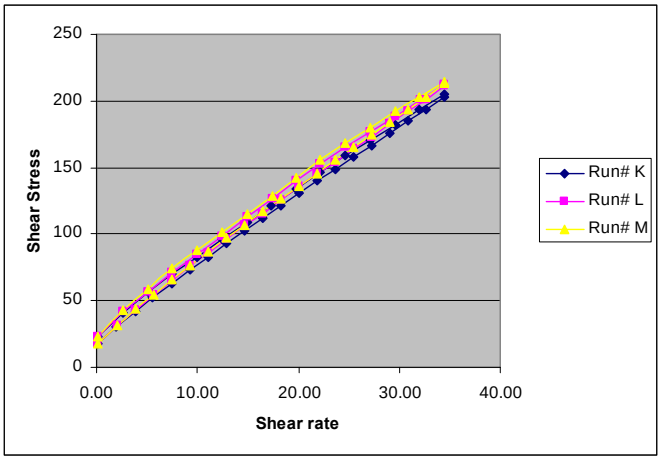
					Average	Stdev
YS	25.6		22.6	25.4	24.5	1.7
VS	7.0		5.3	7.4	6.6	1.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	432		126	624	394	251



Set F7: CS-BX1 – BL33- L2 – 7 day – NIST code (folder SR 59-SR-56C)

SR-56C							
Run# K		Run# L		Run# M		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.20	22.65	0.20	22.66	0.21	22.81	0.20	22.71
2.65	40.94	2.65	41.46	2.65	43	2.65	41.80
5.10	56.34	5.09	57	5.09	58.94	5.09	57.43
7.52	70.07	7.52	71.2	7.52	73.77	7.52	71.68
10.00	82.93	10.00	84.9	10.00	88.09	10.00	85.31
12.41	95.84	12.41	98.73	12.41	101.9	12.41	98.82
14.90	108.9	14.90	113	14.90	115.1	14.90	112.33
17.31	121.5	17.38	126.4	17.38	129.1	17.36	125.67
19.79	134.2	19.79	140.2	19.79	142.1	19.79	138.83
22.21	146.8	22.21	152.5	22.21	155.5	22.21	151.60
24.69	158.8	24.69	165	24.69	168	24.69	163.93
27.10	170.2	27.10	177.3	27.10	179.6	27.10	175.70
29.59	181.8	29.59	188.7	29.59	192.1	29.59	187.53
32.00	193	32.07	200.7	32.00	202.9	32.02	198.87
34.48	204.6	34.48	212.3	34.48	214.9	34.48	210.60
34.48	203.1	34.48	210.9	34.48	213.1	34.48	209.03
32.69	193.6	32.69	201.2	32.69	203.1	32.69	199.30
30.83	185	30.90	192.3	30.90	193.6	30.87	190.30
29.03	176.1	29.03	182.9	29.03	183.8	29.03	180.93
27.24	166.2	27.24	172.4	27.24	175	27.24	171.20
25.45	157.7	25.45	164	25.45	164.9	25.45	162.20
23.66	148.1	23.66	153.9	23.66	156.1	23.66	152.70
21.86	139.7	21.86	145.2	21.86	145.8	21.86	143.57
20.00	130.3	20.07	135.5	20.07	136.3	20.05	134.03
18.28	121.1	18.21	125.3	18.21	126.5	18.23	124.30
16.41	111.6	16.41	115.5	16.41	116.9	16.41	114.67
14.62	102.3	14.62	106.2	14.62	106.8	14.62	105.10
12.83	92.81	12.83	96.35	12.83	96.84	12.83	95.33
11.03	82.75	11.03	86.15	11.03	86.94	11.03	85.28
9.24	73.13	9.24	75.89	9.24	76.35	9.24	75.12
7.45	62.9	7.45	65.33	7.45	65.78	7.45	64.67
5.60	52.43	5.61	54.5	5.61	54.91	5.61	53.95
3.81	41.78	3.81	43.29	3.81	43.64	3.81	42.90
2.01	30.24	2.01	31.51	2.02	31.82	2.01	31.19
0.20	17.65	0.21	17.99	0.21	18.28	0.20	17.97

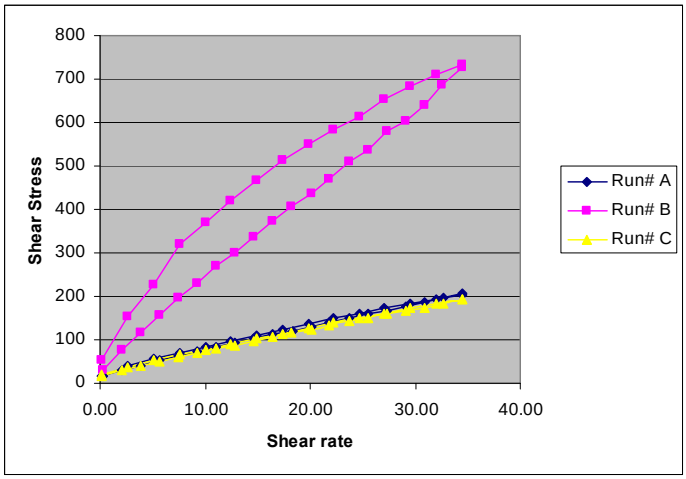
					Average	Stdev
YS	22.3		23.1	23.2	22.9	0.5
VS	5.3		5.5	5.6	5.5	0.1
R2	1.0		1.0	1.0	1.0	0.0
Hysteresis	120		118	155	131	21



Set F7: CS-BX1 – BL6- L1 – 7 day – NIST code (folder SR 59-SR-56D)

SR-56D							
Run# A		Run# B		Run# C		Average	
SR	SS	SR	SS	SR	SS	SR	SS
0.28	16.67	0.20	52.37	0.19	20.63	0.22	29.89
2.63	40.2	2.66	153.1	2.65	38.28	2.65	77.19
5.10	55.69	5.10	226.6	5.10	52.63	5.10	111.64
7.52	69.86	7.59	320.8	7.52	65.48	7.54	152.05
10.00	83.46	10.00	368.8	10.00	78.2	10.00	176.82
12.41	96.94	12.41	420.7	12.41	90.57	12.41	202.74
14.90	110.4	14.90	468.1	14.90	102.4	14.90	226.97
17.31	123.8	17.31	512.1	17.31	115	17.31	250.30
19.79	136.6	19.79	551.6	19.79	126.5	19.79	271.57
22.21	148.8	22.21	581.7	22.21	139	22.21	289.83
24.69	160.6	24.69	614.1	24.69	150.4	24.69	308.37
27.10	172.3	27.10	653.6	27.10	160.9	27.10	328.93
29.59	183.5	29.59	684.7	29.59	172.5	29.59	346.90
32.00	194.9	32.00	711	32.00	182.9	32.00	362.93
34.48	206.2	34.48	733.6	34.48	194.2	34.48	378.00
34.48	205	34.48	725.7	34.48	193.3	34.48	374.67
32.69	195.6	32.62	685.5	32.69	184.7	32.67	355.27
30.83	186.7	30.90	640.8	30.90	175	30.87	334.17
29.03	177.7	29.10	604.5	29.03	166.3	29.06	316.17
27.24	168.1	27.24	579.8	27.24	159.1	27.24	302.33
25.45	159.2	25.45	538.2	25.45	149.4	25.45	282.27
23.66	149.6	23.66	510.7	23.66	141.8	23.66	267.37
21.86	140.7	21.86	469.5	21.86	132	21.86	247.40
20.07	131.3	20.07	437.4	20.07	123.5	20.07	230.73
18.28	121.5	18.21	407.9	18.21	115.5	18.23	214.97
16.41	111.9	16.41	373.8	16.41	106.6	16.41	197.43
14.62	102.7	14.62	335.6	14.62	96.7	14.62	178.33
12.83	92.71	12.83	300.1	12.83	87.79	12.83	160.20
11.03	83.12	11.03	268.4	11.03	78.78	11.03	143.43
9.24	73.04	9.24	230.5	9.24	69.16	9.24	124.23
7.45	62.89	7.45	195.9	7.45	59.21	7.45	106.00
5.61	52.09	5.59	157.2	5.61	49.69	5.60	86.33
3.82	41.41	3.81	117.6	3.82	39.37	3.82	66.13
2.01	29.9	2.01	77	2.01	28.46	2.01	45.12
0.20	16.84	0.21	29.48	0.19	16	0.20	20.77

				Average	Stdev
YS	21.5	43.7	20.8	28.7	13.0
VS	5.4	19.6	5.1	10.0	8.3
R2	1.0	1.0	1.0	1.0	0.0
Hysteresis	139	2849	114	1034	1571



Appendix C: Draft certificate

National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 2492

Bingham Paste Mixture for Rheological Measurements

This Standard Reference Material (SRM) is intended for use in calibrating rheometers for measuring the rheological properties of cement and concrete. The SRM unit consists of 3 containers, one glass bottle with of corn syrup (500 g) and 2 plastic jars of limestone powder (300 g each).

Certified Values and Uncertainties: A NIST certified value is a value for which NIST has the highest confidence in its accuracy and that all known or suspected sources of bias have been investigated or accounted for by NIST. The certified values are given in Table 1 and are based on measurements made using a parallel serrated plate rheometer. The certified values are the mean of results from analyses performed at NIST by a single operator

The expanded uncertainties of the certified values are consistent with the NIST uncertainty policy described in the NIST Technical Note 1297 [1], but were computed using a Bayesian statistical analysis described in the related report on the development of this SRM [2]. All expanded uncertainties are reported at the 95 % confidence level.

Table l. Certified Values

Measurand	Age [days]	Mean Value [Pa]	Standard Uncertainty [Pa]	Degrees of Freedom	Coverage Factor	Expanded Uncertainty [Pa]
Bingham Yield stress	1	32.2	1.999	3.7	2.8675	5.7
	3	26.4	1.242	4.2	2.7251	3.4
	7	26.2	1.753	4.0	2.7764	4.9
Measurand	Age [days]	Mean Value [Pa.s]	Standard Uncertainty [Pa.s]	Degrees of Freedom	Coverage Factor	Expanded Uncertainty [Pa.s]
Bingham plastic viscosity	1	7.2	0.537	4.0	2.7764	1.5
	3	6.5	0.481	4.0	2.7764	1.3
	7	7.1	0.885	4.1	2.7499	2.4

Expiration of Certification: The certification of SRM 2492 is valid, within the measurement uncertainties specified, until **31 December 2022,** provided the SRM is handled in accordance with the instructions given in this certificate (see "Instructions for Use"). This certification is nullified if the SRM is contaminated or otherwise modified.

Maintenance of Certification: NIST will monitor representative samples from this SRM lot over the period of its certification. If substantive changes occur that affect the certification before the expiration date, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification

Jonathan Martin, Chief
Materials and Construction Research Division

Gaithersburg, MD 20899
Certificate Issue Date: XXXX
See Certificate Revision History on Last Page

Robert L. Watters, Jr., Chief
Measurement Services Division

The preparation of the material and the coordination of the technical measurements leading to certification were performed by C. Ferraris of the NIST Materials and Construction Research Division.

Statistical consultation on measurement design and analysis of the certification data was performed by W.F. Guthrie of the NIST Statistical Engineering Division.

The support aspects involved in the issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by M. P. Cronise of the NIST Measurement Services Division.

INSTRUCTIONS FOR USE

Stability and Use: The material can be stored at room temperature until the expiration date posted on page 1 of this certificate. Once the two components are mixed in the proportion and using the method described below the SRM needs to be used within 7 d. The SRM batch needs to be prepared by the operator before it can be used. To prepare the mixture, follow the instructions below. The mixture's composition is:

- Corn Syrup: 200 g
- Distilled water: 63.16 g
- Limestone: 458.1 g

The mixing equipment and the method are described in ASTM C1738. Introduce the water and the corn syrup (in that order) into the blender, mix for 30 s and then proceed as described in ASTM C1738 to introduce the limestone. The water bath and the rheometer should be maintained at 23 °C. Store the mixture is a sealed plastic jar. It is recommended to use a plunger mixer to remix the prepared SRM before each use. Keep the SRM at 23 °C ± 2 °C.

Material Selection and Packaging: The limestone was purchased in bulk and the corn syrup was purchased in 1 gal bottles. The packaging contains enough material to perform two batches of the SRM. It has one glass bottle labeled "Component 1 Corn Syrup" and two plastic containers labeled "Component 2 Limestone". Each of the plastic containers has enough limestone for one batch while the glass bottle has enough corn syrup for two batches.

Homogeneity Assessment and Certification Analyses: Certification analyses for Bingham parameters were performed at NIST on 12 randomly selected units of the SRM. The uncertainties reported for the certified values include allowances for random measurement variability, day-to-day variability, and potential material heterogeneity between units. Further details on the analysis of the data can be found in [2].

Information Values: None provided NIST information values are considered to be of interest to the SRM user, but are not certified because insufficient information is available to assess adequately the uncertainty associated with the values or only a limited number of analyses were performed.

REFERENCES

[1] Taylor, B.N.; Kuyatt, C.E.; NIST Technical Note 1297, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (1993).

[2] Ferraris, C.F.; Winpigler, J.; and Guthrie, W.F.; SP 260-xxx, *Certification of SRM 2492: Bingham Paste Mixture for Rheological Measurements* (2011).

Certificate Revision History: none

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail srminfo@nist.gov; or via the Internet http://www.nist.gov/srm.