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Interoffice Communication

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Subject PROPOSAL FOR VARIABILITY STUDY AT ABERDEEN PVC PLANT

Background

The goal of several R&D projects recently has been the improvement of PVC resin properties with a special emphasis on particle size distribution. Colloid changes and agitation modifications have been a major part of this effort. During these programs, it became apparent that batch-to-batch variation within the plant exceeded the magnitude of improvement that could be accomplished by the research efforts. Successful elimination of the variability would allow the research efforts to reach their goals or possibly achieve them independently. Therefore, it is proposed that a study be performed at the Aberdeen PVC Plant to monitor and gain an understanding of the causes of variability so as to allow its reduction and allow effective research.

Proposed Program

It is proposed that the overall variability study be discussed in the following four phases:

1. Analytical
2. RVCM Test Run
3. Data Collection and Engineering Monitoring
4. Test Runs

An overall time line for accomplishing these phases is shown in Table 1. Manpower requirements are indicated in Table 2. The timing and manning are more fully discussed in the following sections.

Analytical considerations are of prime importance in formulating the strategy for a variability study. In the past, the ability to carry out a study such as this one was severely hampered due to limitations of methods to analyze the particle size of large numbers of PVC resin samples. The new

Microtrac particle size analyzer now allows the quick analysis of sufficient sample numbers. Ed Sones is coordinating the analytical effort which has the following goals:

1. Improve operator technique on Microtrac

2. Define particle size distribution variation versus dump time

3. Determine validity of sampling technique

4. Review best sample point location

5. Define best method for reporting Microtrac data

As Table 1 indicates, the analytical evaluation should be completed by mid January. Success of the evaluation is obviously necessary to proceed with the remainder of the variability study.

RVCM Test Run

The chemical variations which could occur in RVCM emerged as the most obvious cause of batch-to-batch variation. It has been known that colloid adjustments are sometimes needed when the amount of RVCM charged to a reactor is changed. However, this does not appear to be a very defined phenomenon. The chemical variation (impurities) in the RVCM could account for the difficulty in defining the effect of RVCM. Because RVCM is number one on the list of suspected causes of plant variability, it is suggested that a plant test be carried out specifically examining the effect of RVCM prior to trying to tackle the long list of variables that remain.

Based on a suggestion by John Friend, the best way of examining the RVCM problem is to isolate a reactor and charge only fresh VCM to it for as many batches as possible (until RVCM inventory reaches a maximum). Charlie Miller had indicated that approximately ten batches with fresh VCM could be made in one test period. Charlie will spearhead the effort to isolate one reactor and carry out this study.

Sampling will occur directly from the slurry line leading from the reactor. The analytical evaluation discussed earlier has proceeded to the point where the optimum sampling technique has been defined. Two-ounce bottles should be used to obtain the slurry sample. The entire sample is then charged to the Microtrac particle size analyzer. Four 2-ounce samples

should be taken per reaction batch with two being retained and two analyzed. The sample load will be small during this phase of the program, and standard screen analyses could be done. However, to be consistent with the rest of the study and to gain some experience with the Microtrac system, it should be used during the RVCM phase. The samples should be taken ten minutes after dump begins. It appears that the first five minutes of dump do not provide a representative sample and also the end of dump is not recommended. Being consistent and sampling at ten minutes into dump should be a reliable procedure.

One R&D representative will be present during the test run to help monitor the operations and interpret the results. Completion of the test run and analysis/reporting of the data is to be completed by February 6.

Data Collection/Engineering Monitoring

The data collection/monitoring phase of the study is by far the most massive and complex part of the program. If the RVCM study does not expose the main cause of plant variability, this phase of the program will proceed. Table 3 lists variables which will be examined. Two segments of this phase of the program are proposed:

1. Task force data collection and observations at the plant

2. Simple data logging for an extended period

As in indicated in Table 1, the task force could begin work in Aberdeen the week of February 16. The purpose is to monitor and record any significant operation taking place at the plant as well as logging all the variables listed in Table 3. Table 4 is a sample log sheet which can be used to organize all the data being collected as well as the analytical results of all the resins being produced. Manpower limitations dictate a limited time period for this phase of the project. A 12 day program is proposed. In order to gather sufficient data or to at least maximize the quantity collected, all 8 reactors should be monitored. Sampling should again be from the slurry line near the discharge pump and the time of sampling should be consistent as is described in the RVCM test run section. Again, four 2-ounce samples per reaction should be collected.

In order to handle the amount of data to be collected and to allow sufficient monitoring of the operation, six technical people are needed to man this phase of the program. Three people per 12-hour shift is planned with one handling primarily control room data and operation and the other two working outside. One R&D representative will be assigned to develop the data analysis technique and report on the results.

Data logging without technical assistance should continue for an extended period after the 12 day period. This could dictate the hiring of a non-technical person to gather as much data from as many reactors as possible. This person would be supervised by a plant engineer; however, the data will be transmitted to the R&D representative handling the data analysis. This logging task should proceed for at least a 2-month period.

During the busiest part of the data collection phase of this project, approximately 50 resin samples per day will be processed through the Microtrac. This should not be a big problem even with no additional analytical support at the plant. There will also be approximately 50 pH samples to be run as well as an increased number of colloid concentration samples to be run. For these reasons, it is proposed that Ponca City supply one person for analytical support. Table 5 shows the instruments in the plant which should be checked out and/or calibrated prior to the test period.

The following additional equipment will need to be secured and installed by the plant prior to the program:

1. O_2 analyzer for water

2. O_2 analyzer for VCM

3. Instrument for measuring amperage off of one reactor agitator

Plant Tests

If at any point in this variability study or in the analysis of the data it becomes apparent that certain variables have a pronounced affect on the resin properties, a plant test will be planned. R&D will design the plant tests and carry them out with the aid of the plant personnel.

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