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OPERATING MANUAL

D-700 PVC REACTORS

ABERDEEN, MISSISSIPPI

I. INTRODUCTION

A. Operator Responsibilities

The purpose of this plant is to safely and economically convert vinyl chloride monomer (VCM) into a useable form of poly vinyl chloride (PVC). This is accomplished by a batch process in which VCM, water, initiator and colloid solution are charged into the reactor and under carefully controlled conditions, PVC with the desired physical properties is produced. This chemical reaction, which changes VCM to PVC, is called polymerization.

The operator helps fulfill the plant's purpose by making sure that quality production is obtained from his equipment without endangering his fellow workers or his equipment. The operator is able to attain his goals in safety, job performance and efficient operation through a training period and on the job experience.

The operator fulfills his responsibilities by:

1. Understanding how his equipment functions.
2. Understanding what role each piece of equipment plays in the process.
3. Keeping a close and regular check on equipment.
4. Knowing how to spot malfunctions and correct them.
5. Keeping his area of responsibility safe and clean.
6. Keeping complete and accurate records.

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I. INTRODUCTION (CONTINUED)

A. Operator Responsibilities (Continued)

The operating Manual will cover the normal responsibilities and duties of the Lead Operator and the Reactor "A" Operator. Each phase in the production method will be covered. In addition to normal operating methods, it will also discuss operations under abnormal and emergency conditions. The operator must be prepared to meet these situations with temporary measures until the abnormal condition is corrected or the emergency crisis ceases to exist.

Safety takes second place to no plant activity. The safety of the plant personnel and equipment is to be carefully considered before any job is started. The Conoco safety slogan, "our work is never so urgent or important that we cannot take time to do it safely", is an idea that can help make the work area safer for everyone when it is put into practice.

Good housekeeping is also an important responsibility of the operators. It requires careful attention for safety reasons and to maintain good working conditions. Cleaning up after job completion is the responsibility of the person doing the job. A job should not be considered complete until all materials are picked up and properly stored.

I. INTRODUCTION (CONTINUED)

B. Process Information

Several types of resins are produced. Resin type is determined by a set of physical properties such as particle size and viscosity. Each type of resin produced requires that a certain set of operating conditions be closely followed so that the desired resin properties are obtained. Minor changes in formulas or operating conditions can cause major differences in the physical properties of the resin. Some factors in determining resin properties are reaction temperature, which helps determine viscosity, colloid, which influences particle size, and the amount of recovered VCM charged, which also effects particle size.

The phases of reactor operation and a brief description of each follows:

1. Evacuation

This step removes all air possible by steam eductors. Too much air left in a reactor will alter particle size. Evacuation should require about five minutes.

2. Charge

Water, Colloid and VCM are charged to the reactor simultaneously through a timed sequence system. The temperature of the reactor contents at the end of charging is determined by the charge water temperature. The reactor will be below run temperature at the end of the charge and jacket steam will be used to raise the temperature to the desired level. Charge should take about nine minutes.

I. INTRODUCTION (CONTINUED)

B. Process Information (Continued)

3. Initiator

The initiator is manually loaded into the initiator injection pot and charged into the reactor after reactor charge is complete.

4. Polymerization

This is the time from the initiator addition until most of the VCM has been converted to resin. The reaction generates heat continuously as liquid VCM becomes PVC resin. Heat that is generated is removed by cooling water on the reactor jacket and condenser. Reaction times varies, but generally requires five to six hours.

5. Recovery and Steam Stripping

Recovery and steam stripping removes most of the un-reacted VCM from the reactor via a compressor-vacuum pump system. Steam is added to the bottom of the reactor and rises through the PVC and water slurry to help remove unreacted VCM. Recovery and steam stripping takes about 40 minutes.

6. Dumping

The PVC resin, after reaction is complete, is in a slurry form. The slurry is dumped to a strainer and dump tank and is pumped to blend tanks in the Dryer Room for drying. Dump requires about 25 minutes.

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III. OPERATING PROCEDURES (CONTINUED)

D. Polymerization (Continued)

3. Emergency Shutdown (Continued)

Runaway Reaction (Continued)

CAUTION: NO is a highly poisonous orange-colored gas. A Scott Air Pack must be worn while killing a reactor with the NO short stop system.

Power Failure

During the event of a power failure the reactors must be killed with NO. The sequence of which reaction to be killed is as follows:

A. All 5305 reactors

B. Remaining reactors - the reactor in polymerization cycle the longest will be killed first.

In all cases of emergency kill the pressure rise in the reaction should continue to be monitored. If the pressure continues to rise, the following steps are to be taken:

A. Equalize the reactor with any other empty or killed reactor of the same type product.

B. If the pressure still continues to rise, vent through the main condenser valve to the recovery system and the recovered VCM receiver.

C. If this will not relieve the pressure buildup, then equalize the reactor with a reactor of different type resin.

D. The reactor pressure buildup may become sufficient to cause opening of the reactor relief valve system. It is possible that the reactor pressure will continue to increase despite the relief valve discharge. If this occurs, the manual vent should be opened as often as needed to prevent failure of the double disc relief assembly.

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III. OPERATING PROCEDURES (CONTINUED)

D. Polymerization (Continued)

2. "A" Operator Duties

about what should be done with the batch.

c. When the lead operator instructs the "A" operator to do so, the batch is killed by adding short stop solution to the reactor. High pressure service water is used to pressure the short stop solution from the short stop charge pot into the reactor through the same piping as the initiator is added to the reactor.

3. Emergency Shutdown

Runaway Reaction

In the event of a runaway reaction the reactor will be killed with the addition of a minimum of 5 gallons AMS. A runaway reaction is defined as a 10°F increase or a 20 psig increase in 5385, 5425, 5462 resins or any temperature or pressure increase in 5305.

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The following parameters are to be the maximum limits on a runaway reaction. The reaction should be immediately killed with NO if either one of the parameters is exceeded.

Resin	Maximum Temperature	Maximum Pressure
5385,5425, 5465	142°F	145 psig
5305	162°F	165 psig

If the reaction is allowed to exceed these limits, it may not be controllable and result in a relief valve or rupture disc discharge to the atmosphere.

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III. OPERATING PROCEDURES (CONTINUED)

D. Polymerization (Continued)

3. Emergency Shutdown (Continued)

Runaway Reaction (Continued)

CAUTION: NO is a highly poisonous orange-colored gas. A Scott Air Pack must be worn while killing a reactor with the NO short stop system.

Power Failure

During the event of a power failure the reactors must be killed with NO. The sequence of which reaction to be killed is as follows:

A. All 5305 reactors

B. Remaining reactors - the reactor in polymerization cycle the longest will be killed first.

In all cases of emergency kill the pressure rise in the reaction should continue to be monitored. If the pressure continues to rise, the following steps are to be taken:

A. Equalize the reactor with any other empty or killed reactor of the same type product.

B. If the pressure still continues to rise, vent through the main condenser valve to the recovery system and the recovered VCM receiver.

C. If this will not relieve the pressure buildup, then equalize the reactor with a reactor of different type resin.

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III. OPERATING PROCEDURES (CONTINUED)

D. Polymerization (Continued)

3. Emergency Shutdown (Continued)

Power Failure (continued)

D. The reactor pressure buildup may become sufficient to cause opening of the reactor relief valve system. It is possible that the reactor pressure will continue to increase despite the relief valve discharge. If this occurs, the manual vent should be opened as often as needed to prevent failure of the double disc relief assembly.

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III. OPERATING PROCEDURES (CONTINUED)

D. Polymerization (Continued)

2. "A" Operator Duties (Continued)

c. When the lead operator instructs the "A" operator to do so, the batch is killed by adding short stop solution to the reactor. High pressure service water is used to pressure the short stop solution from the AMS short stop charge pot into the reactor through the same piping as the agitator mechanical seal purge water inboard seal flush.

3. Emergency Shutdown

Runaway Reaction

In the event of a runaway reaction the reactor will be killed with the addition of a minimum of 5 gallons AMS. A runaway reaction is defined as a 10°F increase or a 20 psig increase in 5385, 5425, 5465 resins or any temperature or pressure increase in 5305.

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