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TRIP REPORT: Agrico Chemical Company, Blytheville, Arkansas

FROM: Mark I. Bornstein and Stephen V. Capone

TO: Eric Noble

PURPOSE: To obtain detailed information and data on the granular urea operations and control systems for the Draft Standards Support and Environmental Impact Statement for New Sources in the Urea Manufacturing Industry

PLACE AND DATE: Agrico Chemical Company, P. O. Box 1049, Blytheville, Arkansas 72315 on 23 June 1978

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DISCUSSION:

I. PROCESS-UREA

Granulated urea is produced at this facility using the Stamicarbon CO_2 Stripping Process for solution production and 3 Spherodizers®* for solids production. The plant was built in 1974 and started operation in 1975. Liquid urea is produced at a rate of 1000 ton/day and each granulator has a capacity of 400 ton/day. During the plant tour the facility was running at full capacity.

The urea solution process is the standard Stamicarbon total recycle with CO_2 stripping. A flow diagram indicating the major process steps is presented in Figure 1. There are three continuous vents from this process and one intermittent vent which have been combined into one tall stack. The continuous vents are: medium pressure absorber, low pressure scrubber and the

* ®"Spherodizer" is a registered trademark of C and I Girdler, Inc.

flash tank condenser from the vacuum evaporators. The intermittent vent is from the carbamate condenser steam drum. Approximately 25 percent of the time 50 psig steam from the steam drum is vented through the common stack because it is not usable elsewhere in the plant. This "dirty" steam contains approximately 100 ppm NH_3 and CO_2. The common stack contains the following constituents: NH_3, CO_2, H_2, N_2, O_2 and water. No controls are used on this stack and a plume was visible.

Presently the solution system is achieving a 90 percent factor. Upsets to the process have not happened very frequently. However, if a shutdown is required there are no vents to the atmosphere other than those previously described. The total time required to shutdown and to restart is approximately 35 to 45 minutes for each phase. . . . . *Note 1 . . . . . The only vessel containing a liquid is the reactor, which is drained to a storage tank during an extended shutdown.

Liquid 70 percent urea leaving the solution production area goes to a holding tank prior to being concentrated to 99.5 percent in a two-stage vacuum evaporator. After the urea is concentrated in the evaporator it is then fed to the three granulators. However, before reaching the granulators an additive is injected into the molten urea. . . . . †Note 2 . . . . . Details concerning the operation of the three granulators were not available from the company officials. They suggested we contact C and I Girdler for further information. They did state that the granulators were of a standard design and rotated at 6 rpm. Changing the revolutions per minute according to company officials would not affect product or emission rates. In fact the equipment previously was run at 9 rpm but because of mechanical wear the granulators were slowed down. Approximately 15 to 20 percent of the urea is recycled through the granulator.

The only control equipment used at the plant are three Joy Turbulaire Type "D" Scrubbers; one for each granulator. The scrubber liquor for these control devices is maintained at 50 percent urea during the summer and 45 percent urea during the winter. The concentration of liquor is monitored using specific gravity as an indicator. During the facility tour, the opacity from the scrubbers was approximately 10 percent.

The production rate is monitored using two weigh belts on each granulator; one on the material leaving the granulator and the second on the product going to storage. Plant officials indicated that these weigh belts were probably not very accurate and were only good for indicating trends. The production rate can be varied by changing the number of urea injection nozzles and the nozzle pressure. The airflow rate through the scrubbers is constant at approximately 50,000 acfm but the airflow rate through the granulator can be changed according to ambient conditions. A damper is used to control outside air to the fan.

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*Note 1 - see Item 1 Confidential Addendum, contact Eric Noble, EPA, 919-541-5213.

†Note 2 - see Item 2 Confidential Addendum, contact Eric Noble, EPA, 919-541-5213.

Solutions are not produced at the plant for sale nor are there any bagging operations. Conveyor belts transfer the finished product to a closed storage building which is not dehumidified. The final product is then rescreened to remove lumps and transported by a belt conveyor to trucks, railroad cars and barges.

There is no specific air pollution control equipment in the plant other than the three Joy scrubbers on the granulators. Sampling ports are available both upstream and downstream of the scrubber and the scrubber outlet has been stack tested in the past. Results of the most recent data available (December 1977) are presented below. All exit stack temperatures are approximately 110°F.

Granulator	lb/hr	scfm	NH_3	lb. part/ton product*
A	1.11	56,181	0.03 vol %	0.08
A	1.69	56,181		0.12
A	0.88	54,218		0.06
B	0.68	54,426	0.05 vol %	0.05
B	1.29	55,780		0.09
B	1.22	56,744		0.09
C	0.88	48,679	0.05 vol %	0.06
C	0.63	46,096		0.05
C	0.46	45,007		0.03

*Assumes production rate of 333 ton/day/granulator.

A standard Method 5 train was used for stack testing which may result in unreasonably low emission rates because the probe was heated and washings were not analyzed for nitrates.

Scrubber liquor to the control equipment are maintained at a 50 percent urea concentration during the summer months and at a 45 percent urea concentration during the winter months. The facility has to run at a lower concentration in the winter to avoid plugging the equipment with solid urea.

II. GENERAL

Two grades of urea are produced by the granulators; fertilizer grade and industrial grade. It is not practicable to make feed grade using granulators because of the quantity of material that would have to be recycled in order to obtain the small particle size required.

During the production of urea solutions 878 Btu are released during the creation of 1 pound of carbamate, while 188 Btu is required to form 1 pound of urea. The design of the Stamicarbon process tries to take advantage

of this exothermic reaction by recycling streams and creating steam where possible for use in other parts of the process.

The reason the plant chose granulation over a prill tower was a result of their past experience with a prill tower. Pollution problems and a high operating cost discouraged them from building another prill tower.

Tank cars and tank trucks are loaded at a rate of 100 ton/hr while barges are loaded at a rate of 200 ton/hr. No controls are used on product handling.

III. RECOMMENDATIONS AND CONCLUSIONS

The control equipment used on the three granulators in the writers' opinion were doing an excellent job. Visible emissions were approximately 10 percent opacity. The overall general appearance of the plant was good and platforms are available for testing the outlet of the scrubbers. However, platforms will have to be erected if stack testing the inlet to the scrubbers is required. Production data is monitored using weigh belts which according to company officials are not very accurate. During a stack test it will be necessary to determine accurate production rate data. It may be possible to obtain this from NH_3 usage to the plant. There are no other pieces of equipment which should be tested at this facility.