

Interoffice Memorandum

TO (Name and Location)	DATE
Mr. P.M. Sykes	10-18-77
(Name and Location)	REFERENCE NO.
Mr. C.S. Schmaltz	CSS-55-77

PROCESS ENGINEERING REPORT FOR SEPTEMBER, 1977CELCONTrioxane - C.L. Hammond, Group Leader (G.L.)

Trioxane product quality was adversely affected by operational upsets and loss of instrument control on T-249 (T0-1 finishing column).

The operational upsets were associated with increased levels of two light ends in the trioxane/benzene system, methyl formate and methoxy methyal. Although neither of these "light ends" exceeded normal trioxane quality limits, their presence has interfered with the operation of other parts of the trioxane system. Methyl formate is present in increased levels in the reactor tower distillate since conversion to vapor feed. CCCTC personnel have been requested by the Plant to determine the mechanism of methyl formate production and recommend a means of reducing it. There is no evidence at the present time that the methyl formate is causing a quality problem directly.

Methoxy methyal has been identified as a major T0 quality problem. It apparently began to increase in concentration in April (1% in T0-Bz and has continued to build (6.8% in T0-Bz in September). Work is being done to determine the cause of this accumulation and to develop a means to remove this component. A contingency plan has been developed to reduce the methoxy methyal should it increase to the point that it begin to appear in the trioxane product. (It is averaging less than 10 ppm which is within trioxane quality specifications).

An action plan has been developed and is being implemented to bring the T0-2 Recovery Evaporator and pressure column systems to maximum efficiency. Steam savings associated with this project are on the order of \$500M per year.

Updated S.O.C.'s have been posted on T0-1 control panel board for T-240, T-242, and T-249. These S.O.C.'s have been well received and appear to accurately reflect process requirements.

Laboratory Trioxane Distillation Studies - Fuchs, (G.L.)

Mr. Dupree has compiled all the data from the captioned studies in table form. A report is forthcoming during October.

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Solution Hydrolysis - C.L. Hammond, (G.L.)

Several case studies and material balances were completed which compared the Ticona dual quench tank system with the Bishop single quench tank system. Based on information from Ticona a steam savings of 2 to 3 lbs stm/lb polymer should be realized. The steam savings are a result of optimization of the Ticona dual quench tank system and results from further limiting the water input rate to the first quench tank.

Catalyst metering problems continue to plague SH-2. Capillary dP flow meters are now being used for flow control, and rotometers are being used to indicate absolute rate of addition. Further evaluation of this system will be made after capillary dP flow meters are calibrated, more sensitive rotometers are installed, and the other Process Engineering recommendations to exclude water from the system are implemented.

Melt Hydrolysis - Fuchs, (G.L.)

The unit ran well during September. ZSK trials are hampered by downtime due to low product demand. Several tests have been completed, however. The MH economic analysis is complete except for an estimation of the solvent recovery cost. Another ZSK screw design is being tried to increase hydrolysis efficiency and has been added to the MH test program.

Yield Improvement - Fuchs, (G.L.)

Methanol losses were up due to poor trioxane quality and polymer unit operations problems. Significant methanol losses have been arrested with the replacement of leaking storage tank manhole covers in the tank farm.

Energy Conservation - Fuchs, (G.L.)

Recommendations on condensate accountability were completed. We are cooperating with the Chemical company energy coordinator, W. Brough, to examine the impact on the Bishop Chemical/Plastics facilities of various energy proposals.

Environmental - Fuchs, (G.L.)

Revisions to Nylon construction permits were made and approved by TACB. The exemption for the TO-1 upgrading has been received.

Finishing - C.L. Hammond, (G.L.)

The evaluation of the M-25 compounding trials on the KoKneader/Crosshead extruder is continuing. Based on a re-evaluation of earlier trials on M-25, at Baker Perkins, it is currently felt that less than

the optimum KK screw design may have been selected. Excessive screw to barrel clearances have also been found and are causing a real wear problem. Trials at Baker Perkins are scheduled for early November to shed more light on M-25 compounding conditions and screw design due to the questions raised by the recent re-evaluation of the 1974 B-P tests.

After an unsuccessful trial a thorough evaluation of SC-33 (the new 8 inch extruder M-25 screw) showed it to have a shallower transition section than SC-63 (a proven 8 inch M-25 screw). This shallow transition is the probable cause of the high melt temperatures and degraded polymer experienced during a recent trial of SC-63 on M-25.

The flake compacting program is continuing. Several vendor queries have been sent out as well as a few samples. One sample has been successfully compacted and is now being evaluated.

Celanex - C.L. Hammond, (G.L.)

A scrap recovery drying system has been designed utilizing exhaust gas off the existing fluid bed dryer. This system will use negligible energy to recover an estimated \$126,000 per year of scrap.

A large volume air sampler has been obtained to test the asbestos level in the Celanex warehouse. Data from these tests will be used for obtaining a permit to install a dust collector.

Nylon - C.L. Hammond, (G.L.)

Another trial was conducted on the high rate Nylon screw, SC-60. The results of the trial are still being evaluated; however, current thinking is that the barrel cooling system modification was successful but that improper surfacing of the screw feed flights by the vendor (or a bowed screw) resulted in high wear and feeding problems. After nine hours of successful production the screw was visibly worn and throughput rates had decreased by 50%.

Miscellaneous

Mr. Bill Dentler was interviewed and has accepted a position as a process engineer. He formerly worked for Texaco in Port Arthur, Texas.


C.S. Schmaltz

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TRIOXANE PRODUCTION UNITS

Trioxane Unit Engineer Report - Gandy

Light Ends in T0 Unit

Light ends in the unit have become a major concern. The T0-2 reactor is now producing a much larger quantity of methyl formate (MeFo) as a side product than before vapor feed. A recent report by Mr. Larry Walker has quantified the reactor side product rate (LLW-20-77). Methoxy methyal has also been increasing in the T0-Bx since April from 1% up to 6.8%. Both of these components are potential problems should they get into the finished trioxane. In the past, the major "light ends" component has been methanol. Now, both methyl formate and methoxy methyal have become important components in the T0-Bz system. Limited removal of methyl formate can be accomplished in the existing water extraction type removal system, but this system is completely ineffective for removal of methoxy methyal. A project is underway to identify the possible sources of methoxy methyal (Plant Chemists/Process Engineering) and develop a process to remove methoxy methyal from the system.

T0-2 Recovery Evaporation

The T0-2 recovery evaporator has never achieved the design HCHO concentration since Phase Six. Bringing the Recovery Evaporator, V-1647- up to design conditions has a potential steam savings of approximately 500M \$/yr. The steam savings would be realized by displacing some of the 240 psig steam used by the Pressure Tower with "waste" steam in the Recovery Evaporator.

The following action plan has been implemented:

1. Establish a base case lab data for evaluation purposes - Complete.
2. Eliminate possibility of steam leaks in reboilers. (Base case data indicated a leak of approximately 5000 #/hr.)

Progress - HE-2335 has been blinded off. A water balance around the recovery evaporator will be performed to help identify which reboiler is leaking.

3. Develop a detailed comparison between T0-1 and T0-2 Recovery Evaporators (F. Trevino).
4. Evaluate condensing system and modify as necessary to eliminate limitations.

Progress - Possible modification to existing condensing system will be evaluated first.

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T-249 Operations

The operation of T-249 was monitored throughout the month. In general, column operation was not good enough to produce M-25 grade polymer. A status report on T-249 with recommendations for improved operations and recommended operating conditions was issued on 9/28 (WDG-18-77). The following action has been taken:

1. The instrument department rebuilt the reflux control valve, and calibrated all instruments. This significantly improved control of the control tray temperature and interface control of the overhead receiver.
2. Trioxane concentration in the overhead was brought under control (6-10 wt %) by increasing the reflux rate.

The column steadied out and M-25 production was possible during the last part of the month.

It should be noted that in repairing the instruments in T-249 that parts were used from other instruments in T0-1. This has jeopardized the capability to operate T0-1 should it be needed.

T-240 Overhead Trioxane Concentration

The source of the high trioxane concentrations in T-240 distillate was traced to the T0-2 Trioxane Recovery Column residue. The problem was resolved by calibrating the control tray temperature on T-303 which was reading 3°F higher than the actual temperature.

Safety Audit - T0-2 Reactor and Reactor Column

A final report of the findings and recommendations of the safety audit was issued (WDG-16-77).

T-302 Reactor Column Residue

The Reactor Column was shut down Sept. 19 to wash the paraform out of the base. This paraform was plugging the residue pumps which resulted in intermittent loss of flow to the Reactor, V-1656, as well as plugging level control instruments. During the shutdown, a circulating line back to the base of T-302 from the residue pump was installed to provide better agitation in the base. Circulation rate is estimated to be 125 gpm.

A recommendation was made that a gravity feed system from T-302 residue to the Reactor be implemented to eliminate similar type problems in the future (WDG-17-77). This gravity return system would completely eliminate corrosion problems in the lower portion of T-302 and should reduce the residence time in the column to the point where paraforming should no longer be a problem.

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Trioxane Unit Support - Filiberto Trevino

Tempered Water System (TO-1 & SH-1)

After a field inspection by the Engineering department, preliminary engineering calculations indicate that the circulation pumps and the major unit supply and return headers are adequate.

A study of the distribution system is continuing.

Caustic Decanter (TO-2)

Still waiting for results from the Tech Center to aid in the development of design criteria for an optimum decanter.

Cooling Water System (TO-2 & SH-2)

In the process of evaluating a "Uniloc" automated control unit similar to the existing Chemical Company installation at "MS".

Presently in contact with Chemical Company in determining operating conditions and costs as well as types of problems experienced by their system.

TO-Bz Density Meter (TO-2)

Mr. S.E. Gregorcyk is in the process of contacting the manufacturer to investigate the operational status of the Density Meter. This will in turn lead to the means of calibrating the meter or justification to obtain a new Density Meter. The density meter currently responds to changes in density in the stream and operations personnel are using the meter as an indicator of extractor operations.

T-242 OVHD Condensers

Since the cleaning of the condensers on Sept. 22, the column has been brought up to max. feed of 70 gpm. However, the column is still condenser limited as the fans have to be run at max. rpm. during the middle of the day.

A performance rating study has been done on these condensers using ZEPHYR, an air cooled exchanger rating design program. Operating conditions were simulated during the hottest part of the day and a performance rating was obtained.

1. A fouling factor of fives times normal is observed.
2. 30% reduction of normal air flow through fins.

The manufacturer has been contacted for information on design operating conditions and means of increasing the air flow. Possibility of replacing old fan blades with a new and more efficient model is being considered as this would enhance the performance of these fan

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V-1647 Recovery Evaporator (T0-2)

A comparison study is presently underway with the T0-1 Recovery Evaporator V-1142 to determine whether any major design , mechanical or operating differences are the cause of the poor performance by V-1647.

Once this study is complete, test procedures and runs will be made.

T-302 Reactor Column (T0-2)

The column was shutdown several weeks ago due to paraforming of formaldehyde in the residue. Monitoring of operations continues daily.

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POLYMER PRODUCTION UNITS

SH Unit Engineer Report - J.L. Chancellor

SH-1

The unit produced M-90 and M-270 quality material during the month. Poor T-249 sidestream quality prevented changing to M-25 as scheduled until Sept. 30.

The Eimco filter belt ran off several times causing excessive solids in the solvent return stream and subsequent plugging of the T-243 feed filters. The alignment mechanism was rebuilt and filter is operating satisfactorily. Poor quality TOX produced by T-249 making it unsuitable for polymer production caused a unit shut down (due to reduced TOX inventories). Unmelted polymer fines plugged the hydrolyzer in the upper north section and caused a third unscheduled shut-down. The unit switched to M-25 production on Sept. 30 to build inventories.

Methanol Recovery Column

Standard operating conditions for T-243 were revised and posted on the unit control panel. The S.O.C. is being followed and the column is operating well. The new spindle and nozzle for the thermo-compressor have arrived and will be scheduled for installation.

SH-2

The unit ran on M-270 and M-90 for the entire month. A plugged feed pump, grinder screen failure, and bad hydrolysis feed pump bearings resulted in approximately 7 hours downtime. Deteriorated catalyst lines caused fluctuating catalyst flows and resulted in poor Kd quality polymer. Capillary tubes and differential pressure cells were placed in service to control catalyst flow at a constant rate and a rotameter was installed to indicate the rate of addition. Polymer quality has improved, and catalyst addition continues to be monitored by rotameter. The present rotameter is operating at the low end of its range and must be switched from MS-1384 to MS-1385 once per shift. Operation in this way is a short term solution only. The DP cells with capillary tubes will be calibrated in the instrument shop in October, and new, lower ranged rotameters have been ordered to provide a back-up to the system. Engineering is also studying a Process Engineering recommendation to replace the catalyst feed lines to minimize the number of fittings and reduce the possibility of moisture introduction into the system.

Dual Quench Evaluation

Material balances comparing present SH-2 operating conditions with those resulting from implementation of Ticona dual quench technology have been completed. Preliminary equipment sizes have been given to Engineering for scoping prior to RFA preparation. A purchase inquiry has been sent to Bird Machine Company for a centrifuge cost estimate. Final equipment specifications are pending the analysis of information obtained by Messrs. Draper, Hammond, and Coulter from their recent trip to Ticona.

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MH-2 Unit Engineers Report - Patel

MH-2 Unit Performance

During the month of September the unit ran well. Occasional Off Spec Color problems were experienced due to low flake tank inventory. Once again, because of low trioxane inventory, the unit was scheduled down.

MH Project Status - Pate & Roman

1. MH Optimization Program - During the early part of this month, an attempt was made to conduct an optimization trial. Once again, due to unavailability of trioxane we could not run the trial for more than two days. The trial program was resumed in the last week of the month.
2. Designed a screw for the ZSK, capable of handling high solvent rate (KHP-48-77). This screw will be installed in MS-1029. Process engineering will provide start up support to establish SOP. Once proper SOP has been established, optimization trial will be conducted on MS-1029, as is being done on the other ZSK.
3. MH overall improvement presentation was outlined to managers.

Next month:

- a. Conduct ZSK optimization trial.
 - b. Calculate trioxane return stream purification cost.
4. MH-2 Economic Analysis:
 - a. Based on actual electrical consumption, yearly cost for electricity has been calculated.
 - b. Completed MH-2 yearly maintenance cost estimation.

Note: Only trioxane return stream purification cost is lacking to complete the MH-2 economic analysis.

5. Catalyst Feed System: Engineering has been asked to prepare detailed mechanical flow diagram drawings and cost estimation. Production has approved the revised flow system concept.

Energy Coordinators Report - Eisenhower

1. Issued a process letter (LDE-9-77) and AVO's relative to improving the condensate metering system.
2. In a joint effort with J. Chambers, changed the steam accounting printout to include Areas 1 and 2 steam summaries and meter range monitoring (LDE-10-77).
3. Organized Chemical and Plastic company steam balances to

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examine usage and export. Participated in discussing this information with W. Brough and C.E. Loeffler at the Chemical company. Began working with W. Brough to develop a uniform Chemical/Plastics energy strategy for the Bishop facility.

4. Began examining possible solidaire capacity increase - submitted samples to develop needed data.
5. Investigated a possible low maintenance, steam trap replacement (constant drain orifice). Relayed information to maintenance.
6. Contributed to the Energy Awareness Committee by updating a portion of the planned employee energy booklet and composed a condensate cost example for the energy bulletin.
7. Gave 2 training lectures on energy to operations personnel.

Energy Conservation Support - Roman

Plant Steam Model

The plant steam distribution has been determined by area. These sketches are being checked with the physical arrangement in the plant. This distribution is being done with the assistance of Larry Eisenhower energy coordinator. The model is planned to be finished in the month of October.

Yield Improvement - Bennett

Methanol

September methanol losses were 780M pounds (0.1678 lbs/lb SH).

Startup problems with T-249 (TOX #1 Finishing Tower) caused a wide fluctuation in the TOX/Benzene composition which caused a shift in the temperature profile of T-305 (T0-2 finishing tower). This allowed 2000ppm of methoxy methylal to exist via the sidestream.

This poor quality trioxane reduced KoKneader conversions and increased melt indexes (50+). Extremely fine particles were precipitated in both SH Units which caused filtration and operational problems and attendant raw material losses.

SH-2 sump losses (methanol) were significantly lower than SH-1 (50.4M lbs- compared to 215.9M lbs). However, an undetermined amount of effluent was pumped out through the rainwater sump from SH-2.

Formaldehyde

Formaldehyde losses totaled 1301.9M pounds compared to 1235.6M in August. Increased KoKneader diversions due to poor trioxane quality contributed to these losses. Trioxane losses in unit sumps were

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SH-1, 70.5M pounds; SH-2, 50.1M; and MH-2, 18.6M. Solids losses were relatively unchanged at 212.9M pounds compared to 211.5M in August.

Methyl formate exported in T-240 overhead increased significantly (100M lbs. Sept., 77.5M August, 51.3M July). This reflects the continuing increase of methyl formate in the TOX process.

The trioxane content of T-240 overhead has increased over the last several months (31.5M lbs. Sept., 23.7 August, 24.2 July, 19.5 June). However, this trend has now been reversed by additional stripping of T-303 residue.

General

The pressure control problems on the T-412 scrubber (an environmental control scrubber for the methanol in the tank farm) were resolved during the first week of September. This scrubber is now operating according to design. Vapors from V-2001 (90,000 gal. capacity) and the methanol storage tanks are now being scrubbed and returned to V-2001, (TOX Recovery Tower Feed Tank).

Continuous, on line, total carbon analyzers are being considered as a possible alternative to manually monitoring effluent carbon losses.

The following table lists current yield improvement project status.

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Yield Improvement Project Status

<u>Project</u>	<u>Reference</u>	<u>AVO#</u>	<u>Status</u>
1. T-243 Feed Filters	LLB-12-77	3048	Piping drawings issued to A.B.
2. Trioxane Transfer Line T0-1 to T0-2	LLB-6-77	1045	Cancelled
3. In-Line Hydrometers (Benzene)	LLB-21-77	2041 2064	Money approved to install one on T-3 On order.
4. Reducing Methanol Vapor Losses on Tank Farm	LLB-23-77	3065	Complete
5. T-238 Latent Heat Reboiler	FCC-15-74		T0-1 RFA
6. MH-2 Optimization KoKneader & ZSK	KHP-43-77		Optimization trial on one ZSK began this month.
7. Trioxane Contamination T0-Bz	LLB-7-77	3041	Completed
Storage Tank Vapor Losses HCHO, B ₂ , T0-B ₂	LLB-27-77		Manhole gaskets replaced; Corroded manhole covers replaced All covers to be upgraded to hold 8"H pressure.
9. Column Pump Out Facilities T0-1	LLB	1064	Money approved; material delivery date Oct. 15.
10. Methylal-Cyclohexane	LLB	3049	Engineering in process.
11. Flow Totalizers & Sample Compositors for Rainwater Systems	LLB-31-77	1072 2084	In Engineering for Scoping
12. Nash Vacuum Seal Return SH-1	JLC-2-77		In Engineering for Scoping

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Yield Improvement and Environmental Support - Roman

Methanol and Benzene Vent Scrubbers

Studies have continued on the vent scrubbers in the tank farm to determine optimum arrangement for minimum losses.

The manhole covers on the storage tanks have been replaced. These manhole covers have been tested and their pressure ratings have been improved from 4" H₂O to 8" H₂O. This will eliminate leakage of these storage tanks to the atmosphere.

New material balances will be done based on samples from these vent scrubbers. Based on these material balances, a dispersion model will be used to calculate the ground level concentration of benzene in the area of the vent scrubbers. Using this model, it can be determined which collection arrangement of storage tanks by the scrubbers is the optimum from an environmental standpoint.

The arrangements that will be considered are the following:

1. Methanol tanks (V-1069, V-1070, V-1071, V-1975); slop tank (V-2001), venting to Methanol vent scrubber (T-412) (Actual arrangement).
2. Benzene tanks (V-1060, V-1840); T0-Bz tanks (V-1839, V-1660, V-1661), venting to Benzene vent scrubber (T-407) (Actual arrangement).
3. Methanol tanks, slop tank, formaldehyde slop tanks (V-1058, V-1063, V-1065), venting to T-412.
4. Slop tank (V-2001); formaldehyde slop tanks, venting to a proposed vent scrubber.

Methanol concentrations in slop tank V-2001, will also be checked to determine to what extent it will affect the process in the trioxane recovery area. This will be based on a computer program designed to evaluate the light ends system.

Environmental Maintenance Coordinators Report - Garza

Following is a list of items worked on during the month of September:

1. Nylon Construction Permit - Revisions to the Nylon Consturction Permit were published and discussed with the TACB Permit Engineer in Austin. Also, the regional TACB office in Corpus Christi was notified as to the revisions. The project has approval to start construction.
2. An exemption permit for the T0-1 up-grading project has been applied for and received.

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3. Environmental seminars have been presented to hourly employees in their training sessions.
4. Information concerning air emissions and effluent during U-10 processing has been provided to Dr. T.J. Dolce in Summit.
5. The Celanex Phase I Permit has been reviewed and everything found was in order.
6. Started working on the Plants Environmental Maintenance Budget. This has not been completed.
7. Mr. Bill Smalling of the TACB regional office requested information as to the amount of HMDA to be evaporated from the surface of the Solar Ponds once we start-up the Nylon Unit. Mr. Bill Humphrey at the CCCTC will furnish this data to me and I will transmit to Mr. Smalling.
8. Work is currently in progress towards:
 - a. Presenting an Environmental Seminar to the process and engineering departments. This will be done towards the middle of October.
 - b. Prepare and present a seminar to the operations department as to environmental control laws and reporting of excursions. This will be done in the first week of November.
 - c. Obtaining a construction permit for the asbestos dust collector.

Finishing Unit Engineer Report - Rollins

Celcon

The problems associated with the M-25 trials on MS-1288/1289 are being investigated. Improper KK screw design and high screw to barrel clearances are suspected to be causing feed, melting, and seal wear problems. Trials at the Baker Perkins test lab have been scheduled for November 1,2,3 to simulate our production problems and determine a solution.

8" M-25 Screw (SC-33)

The SC-33 screw (new) and the SC-63 screw were compared to each other, flight by flight, and then matched to the SC-63 drawing. None of them matched so the SC-63 drawing was changed to match the actual SC-63 dimensions and SC-33 was returned to Mallay Corporation to be modified to match SC-63. The transition section of SC-33 was found to be shallower than SC-63, which explains the high melt temperatures and degraded polymer experienced during the September trial.

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Finishing Support - Swinler

Compacting Study

All vendor queries out. A 5 lb. sample of unstabalized M-25 was successfully compacted by Bepex Corporation and returned to the plant for inspection. Returned sample was of insufficient size for laboratory analysis. Visual inspection of sample indicates some surface fusion of material compacted under high pressure. Further testing should more clearly define the effect of this fusion on finished polymer properties. Emphasis at this time is being given to manufacturers who can supply "briquetting" or "pelletizing" compactors to reduce the number of material handling steps required.

"C" Number Support

Form "A"s received for C-243 and C-254X this month. Final "B" for C-254X out however. C-243 still awaiting costing.

Engineering Support

Gathering information on production of M-25, 90 and 270 for optimum die land-length recommendation to plant engineering for new Crosshead extruder die.

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CELANEX

September Status Report - N.A. Rollins

Celanex

A scrap recovery system has been designed that will recover Celanex Phase I material. By using the energy off of the existing fluid bed dryer, negligible energy will be required to recover an estimated \$126,000/yr. of scrap product. Payback will be less than two months.

A qualification trial was conducted using a modified binder in OCF fiberglass. Physical properties were all on-spec and no operational problems were encountered.

40,000 pounds of J-189 were produced with no operational problems. The material was on-spec.

Asbestos Monitoring - Swinler

Obtained large volume air sampler from CCTC for use in predicting potential loading to atmosphere from Celanex warehouse dust collector. Modifications to air sampler will be required to fulfill our obligation. The maintenance department is currently fabricating required adapters.

One dozen three piece 0.8 μ filter cartridges are on order from Clayton labs for use in a particle size distribution study to be undertaken for the warehouse dust collector construction permit. Ten samples will be taken and analysed for particle size. Additionally one sample will be examined for free asbestos.

"J" Number Support - Swinler

No new "J" numbers were received this month.

A process hazard analysis was undertaken for J-197. The salt and pepper blending of Foam-Kon 23 with 3300 was found safe providing proper safeguards are implemented for the storage and handling of Foam-Kon. Ref: GSS-10-77.

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NYLON

MS-383 Safety Audit - Swinler

Audit complete. Preliminary report out shortly.

Nylon - Rollins/Swinler

Another trial was conducted on MS-383, producing 1503 black with the SC-60 screw and a temporary cooling system on zone 1. Good temperature control was attained across the barrel but feeding problems halted the test after nine hours of successful production. The trial is being analyzed. A bowed screw and/or improper surfacing of the feed flights is suspected to have caused the feeding problems. After less than 30 hours production time using SC-60, up to .030" wear on the flights has been found.

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