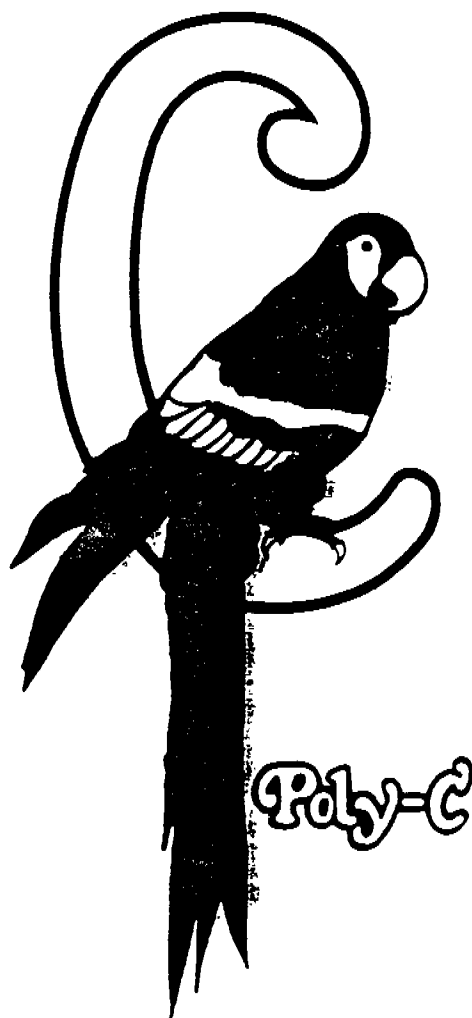




POLYETHYLENE "C" PLANT

REACTIVE CHEMICALS REVIEW

MAY 18, 1989

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POLY C
REACTIVE CHEMICALS REVIEW

May 18, 1989

Trains 1 and 2:

Process Introduction and Flow Diagram	Kim Switzer
Raw Materials and Supplies	Alvin Hebert
Unloading and Storage	Danny Leblanc
Catalyst Preparation	Kim Switzer
Ethylene Purification and Compression	Kevin Alexcee
Reaction	Bruce Miles
Calcium Stearate	Kim Switzer
Devolatilization	George Shofoluwe
Pelletizing	George Shofoluwe
Material Handling	Jeff Sims
Additive System	Kevin Alexcee
Solvent Recovery and Purification	Kevin Alexcee
Dowtherm System	Kim Switzer
Flare	Danny Leblanc

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Train 3:

Train 3 Overview

Robert Moore

Ethylene Compression Differences

Wesley Gibbs

Solvent System Changes

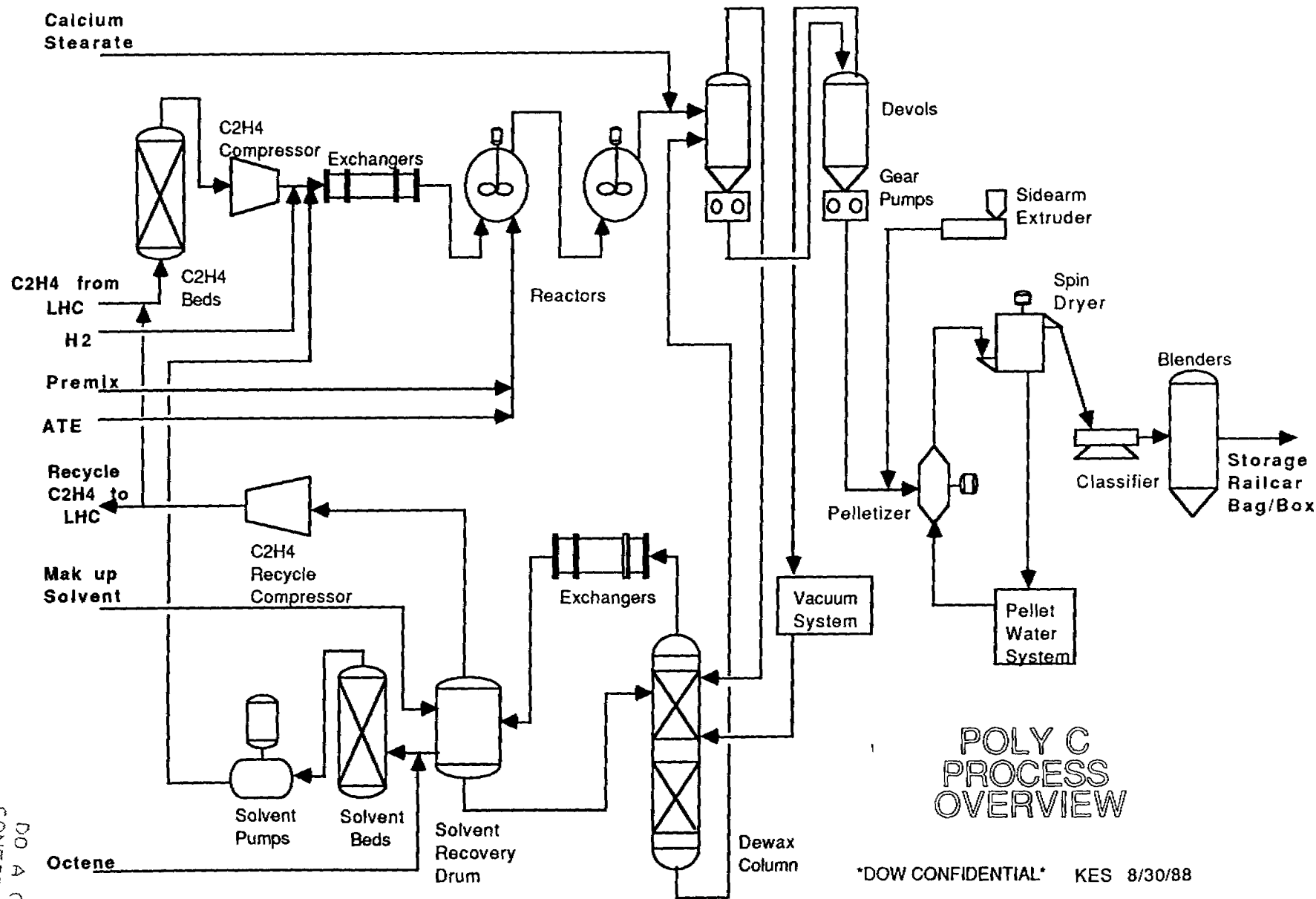
Brenda Lane

Furnace Modifications

Dan Bucholtz

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POLY C PROCESS OVERVIEW

DOW CONFIDENTIAL KES 8/30/88

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POLY C RAW MATERIALS

MONOMERS AND HYDROGEN

<u>MATERIAL</u>	<u>STORAGE CAPACITY</u>	<u>VENDORS</u>
ETHYLENE	PIPELINE	DOW
HYDROGEN	PIPELINE/ TUBE TRAILER	AIR PRODUCTS
OCTENE-1	258,000 GALS. (2 TANKS)	ETHYL, SHELL

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POLY C RAW MATERIALS

ADDITIVES

<u>MATERIAL</u>	<u>CONTAINER</u>	<u>QUANTITY STORED</u>	<u>VENDORS</u>
CALCIUM STEARATE	TOTE BINS (2,100 LBS)	28 MAXIMUM	MALLINCKRODT
ERUCAMIDE (SLIP)	100 LB. FIBER PK.	0 LBS.	ARMAK, HUMKO
IRGAFOS 168	110 LB. FIBER PK.	0 LBS.	CIBA-GEIGY
IRGANOX 1010	110 LB. FIBER PK.	12,000 LBS. MAXIMUM	CIBA-GEIGY
ADDITIVE CONCENTRATES (SUPERFLOSS, IRGAFOS, SLIP)	180,000 LB. BRC 45,000 LB. H.TRK.	650,000 LBS.	SOUTHWEST CHEM. BAYSHORE
DHT-4A	44 LB. BAGS	3000 LBS.	MITSUI

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POLY C SUPPLIES

CATALYST COMPONENTS

<u>MATERIAL</u>	<u>STORAGE CAPACITY</u>	<u>VENDORS</u>
TRIETHYL ALUMINUM (ATE) (10% IN HEPTANE)	12,000 GALLONS	TEXAS ALKYLs, ETHYL
BUTYL ETHYL MAGNESIUM (BEM) (15% IN HEPTANE)	20,000 GALLONS	TEXAS ALKYLs
TETRAISOPROPYL TITANATE (50% IN HEXANE)	2 - 250 GALLON CYLINDERS	AKZO
HCL - ANHYDROUS	PIPELINE	DOW
ETHYL ALUMINUM DICHLORIDE (EADC) (15% IN HEPTANE)	12,000 GALLONS	TEXAS ALKYLs, ETHYL
DIBUTYL MAGNESIUM (DBM) (21% IN HEPTANE)	16,000 GALLONS	LITHIUM CORPORATION
TITANIUM TETRACHLORIDE (TiCl4)	2 - 5 GALLON CYLINDERS	AKZO
VANADIUM TETRACHLORIDE (VC14)	2 - 5 GALLON CYLINDERS	STRATCOR

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POLY C SUPPLIES

OTHER

<u>MATERIAL</u>	<u>STORAGE CAPACITY</u>	<u>VENDORS</u>
ACTIVATED ALUMINA	10,500 LBS.	COASTAL CHEMICAL
DOWTHERM A	44,000 GALLONS (2 TANKS)	DOW
ISOPAR E (666 SOLVENT)	24,000 GALLONS (50,000 GALLONS IN PROCESS)	EXXON
KATALCO	3,000 LBS. (2 BEDS)	KATALCO INC.
MINERAL OIL	5,900 GALLONS	WITCO
MOLECULAR SIEVE	63,100 LBS. (9 BEDS)	UNION CARBIDE
SILICA GEL	61,400 LBS. (6 BEDS)	COASTAL CHEMICAL

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POLY C SUPPLIES

WATER TREATMENT CHEMICALS

<u>MATERIAL</u>	<u>STORAGE CAPACITY</u>	<u>VENDOR</u>
BETZ DE1187	1,000 GALLONS	BETZ
CHLORINE	2 - 1 TON CYLINDERS	VAN WATERS AND ROGERS
SODIUM CARBONATE	4 - 55 GALLON DRUMS	CHARLOTTE CHEMICAL CO.
CORRSHIELD 736	1 - 55 GALLON DRUMS	BETZ

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MONOMERS AND HYDROGEN

MATERIAL

QUALITY CHECK

ETHYLENE

HYDROGEN

--/GAS CHROMATOGRAPH

OCTENE - 1

INFRARED

ADDITIVES

MATERIAL

QUALITY CHECK

CALCIUM STEARATE

INFRARED

ERUCAMIDE (SLIP)

INFRARED

IRGAFOS 168

INFRARED

IRGANOX 1010

INFRARED

SUPERFLOSS

ASH

DHT-4A

INFRARED

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CATALYST COMPONENTS

<u>MATERIAL</u>	<u>QUALITY CHECK</u>
ATE	TITRATION FOR Al
BEM	TITRATION FOR Mg
TITANATE	INFRARED
HCl	-----
EADC	TITRATION FOR Al TITRATION FOR Cl
DBM	TITRATION FOR Mg
TiCl ₄	ATOMIC ABSORPTION
VC14	ATOMIC ABSORPTION

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OTHER

MATERIAL

QUALITY CHECK

ACTIVATED ALUMINA	BULK DENSITY/VISUAL INSPECTION
DOWTHERM A	INFRARED
ISOPAR E (666 SOLVENT)	INFRARED
KATALCO	-----
MINERAL OIL	INFRARED
MOLECULAR SIEVE	BULK DENSITY/VISUAL INSPECTION
SILICA GEL	BULK DENSITY/ INSPECTION

WATER TREATMENT CHEMICALS

MATERIAL

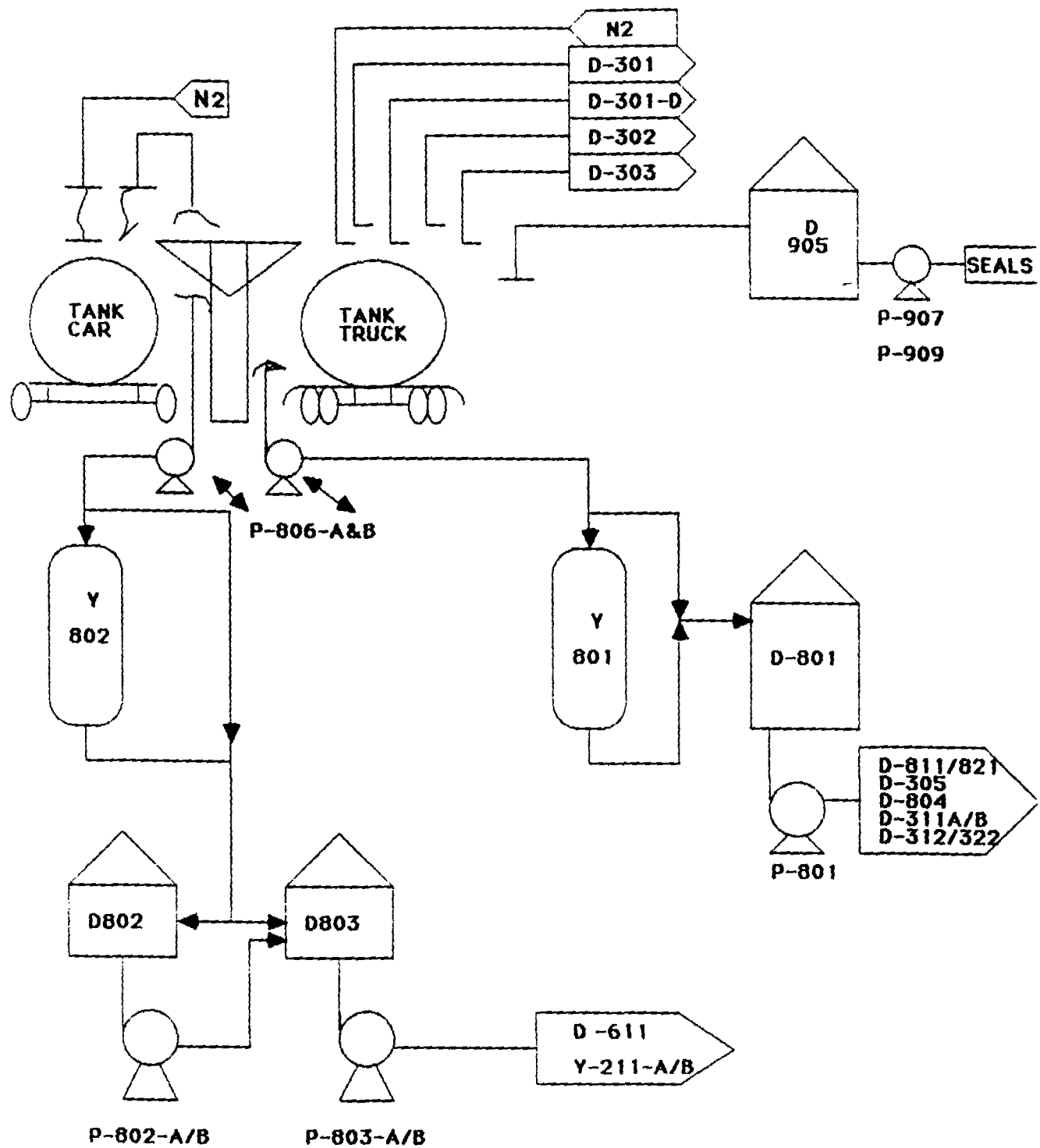
QUALITY CHECK

BETZ 1187	-----
CHLORINE	-----
SODIUM CARBONATE	-----
CORRSHIELD 736	-----

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UNLOADING AND STORAGE AREA



UNLOADING / STORAGE CONCERNS

POSSIBLE PROBLEMS / PREVENTIVE MEASURES

1. TRANSFER MATERIAL INTO INCORRECT STORAGE VESSEL

PREVENTIVE MEASURE

- A. Each storage vessel has a dedicated fill line with no common piping from the unloading rack
- B. Raw materials are compatible
- C. Unloading rack piping is labeled

2. SPILL AT UNLOADING AREA OR STORAGE AREAS

PREVENTIVE MEASURE

- A. Storage area diked
- B. Both drain to containment pond
- C. All connections are leak checked before unloading begins

3. RUPTURED HOSE

PREVENTIVE MEASURES

- A. Operator will wear a slicker suit when unloading catalyst components
- B. Emergency nitrogen depad system for all raw material unloading
- C. Check valve in piping to each catalyst storage vessel
- D. Hoses are pressure tested once per year

4. STATIC CHARGES

PREVENTIVE MEASURES

- A. Procedures require everything to be grounded
- B. Solvent and octene unloading pumps will not start without a ground

5. OVERPRESSURE OF STORAGE VESSELS DURING UNLOADING OPERATION

PREVENTIVE MEASURES

- A. Nitrogen used to unload is regulated and has PSV'S in lines
- B. Depad regulators are bypassed during unloading to ensure that the vessel does not overpressure
- C. Safety valves lift to D-308

6. CATALYST STORAGE VESSEL RUPTURE

PREVENTIVE MEASURES

- A. High pressure and high temperature alarms
- B. Diked area
- C. Containment pond
- D. Monitor gun with fog nozzle
- E. Deluge system

7. CATALYST COMPONENT VAPORS BACKING UP IN NITROGEN LINE

PREVENTIVE MEASURES

- A. Nitrogen line has higher pressure
- B. Check valve
- C. Double block and bleed

8. CONTAMINANTS GETTING INTO CATALYST VESSELS

PREVENTIVE MEASURES

- A. Positive pressure nitrogen pad
- B. High and low pressure alarm

STANDARD CATALYST RAW MATERIALS

ISOPAR E
(Flammable Liquid)

BUTYL ETHYL MAGNESIUM, 15% IN HEPTANE
(Pyrophoric When Heptane Evaporates)

ANHYDROUS HCL
(Corrosive)

ETHYL ALUMINUM DICHLORIDE, 15% IN HEPTANE
(Pyrophoric When Heptane Evaporates)

TETRA ISOPROPYL TITANATE, 50% IN HEPTANE
(Decomposes Slowly in Air and Moisture to Form
Isopropanol)

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STANDARD CATALYST PREPARATION

Magnesium Dialkyl(MgR_2) + 2 Anhydrous HCl ---->
Magnesium Chloride + 2 RH + 3800 Btu/lb HCl

40 Magnesium Chloride + 12 Ethyl Aluminum Dichloride
+ 3 Tetra Isopropyl Titanate ---->
40 Magnesium Chloride * 3 $TiCl_2OC_3H_7$
+ 12 $Al(C_2H_5)(OC_3H_7)_2$

"Premix Catalyst"

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LT CATALYST RAW MATERIALS

Isopar E

(Flammable liquid)

Dibutyl Magnesium, 21% in Heptane

(Pyrophoric when Heptane evaporates)

Anhydrous HCl

(Corrosive)

Titanium Tetrachloride

(Reacts violently with water)

Vanadium Tetrachloride

(Reacts violently with water to produce combustibles)

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LT CATALYST PREPARATION

Dibutyl Magnesium + 2 Anhydrous HCl ---->

Magnesium Chloride + 2 RH + 3800 Btu/lb HCl

40 Magnesium Chloride + 2 Titanium Tetrachloride

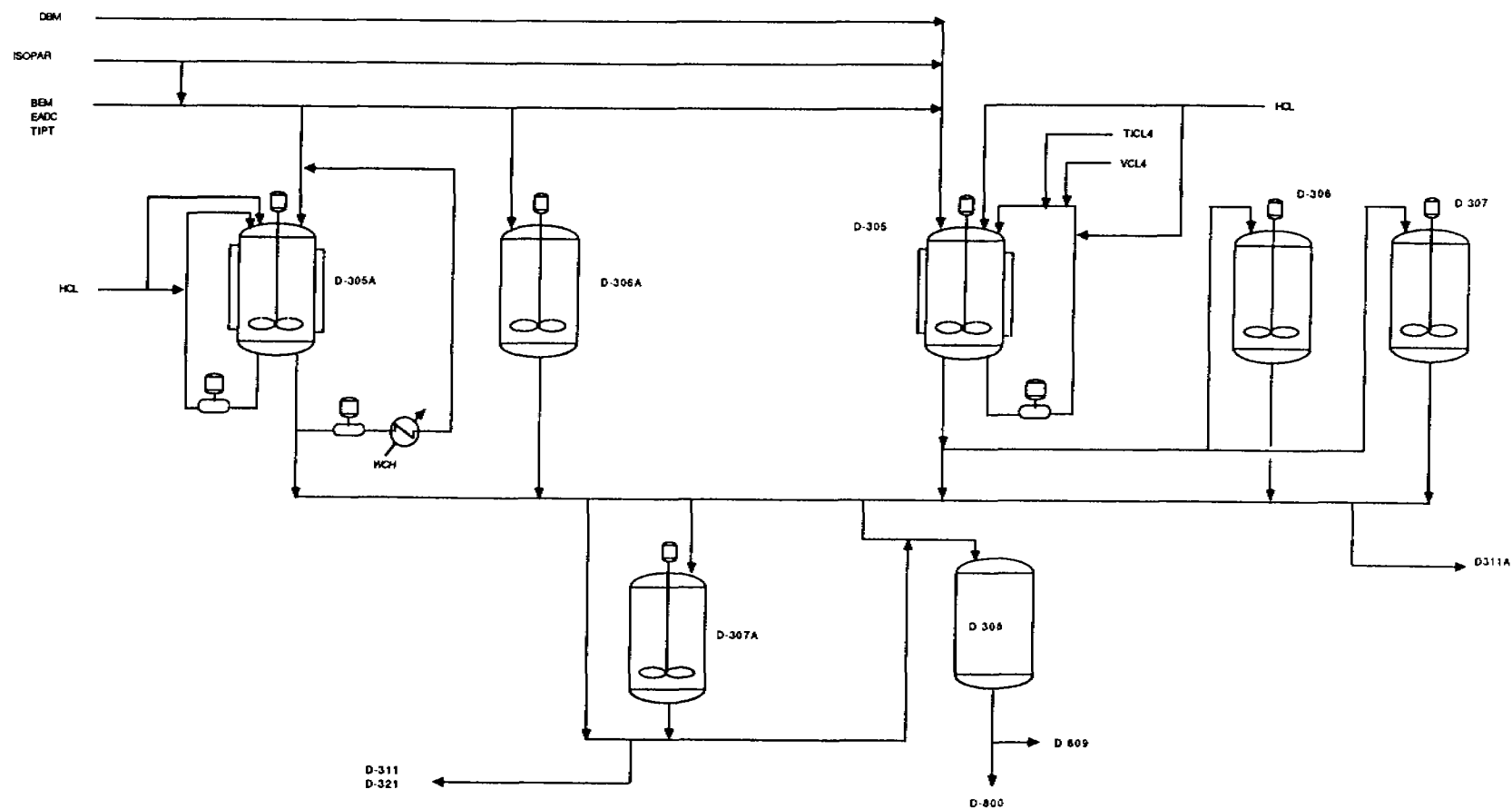
+ 2 Vanadium Tetrachloride ---->

40 Magnesium Chloride * 2 Titanium Tetrachloride *

2 Vanadium Tetrachloride

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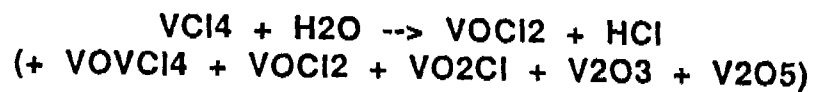
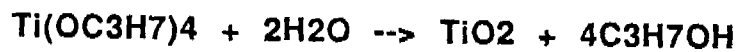
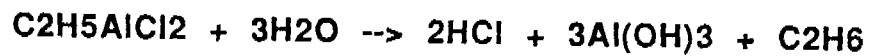
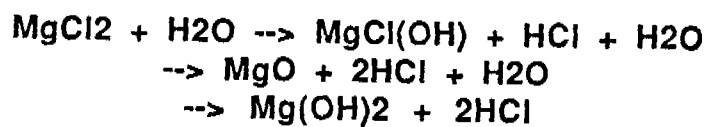


CATALYST PREPARATION FLOW DIAGRAM

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CATALYST KILL IN D-308



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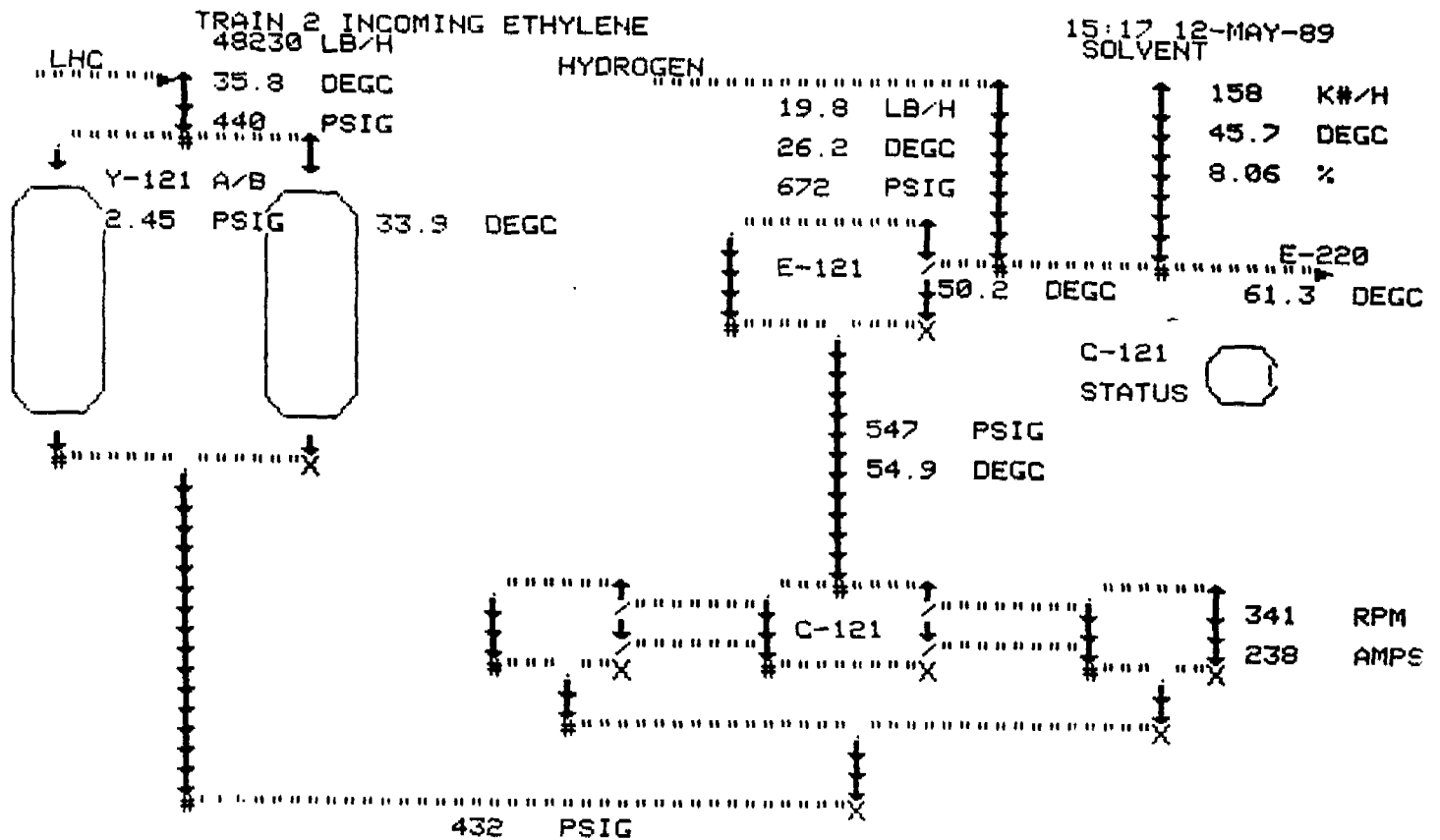
CATALYST PREPARATION

POTENTIAL PROBLEMS/PREVENTIVE MEASURES

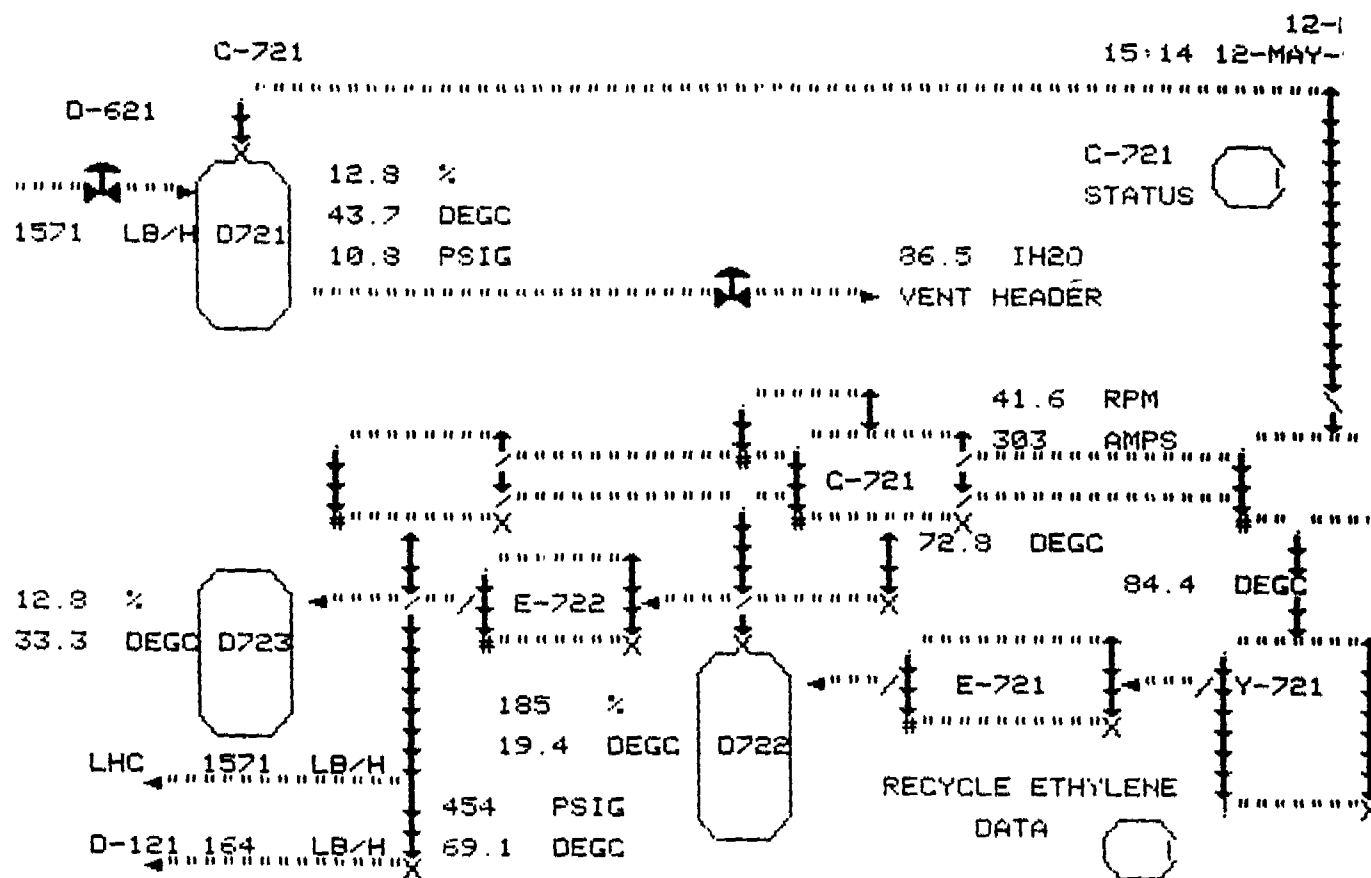
1. RUNAWAY REACTION IN D-305 OR D-305A
 - A. HCl ADDITION SHUTDOWN ON HIGH TEMPERATURE BY MOD V
 - B. PSV'S TO D-308
2. OVERFILL D-308 AND BACKUP THROUGH VENT HEADER
 - A. REDUNDANT HIGH LEVEL ALARMS
 - B. TRANSFER SHUTDOWN ON HIGH LEVEL BY MOD V
 - C. N₂ PURGE ON VENT LINE TO D-308
3. FLUSHING UNKILLED CATALYST FROM D-308 TO D-809
 - A. D-308 CONTAINS WATER AT ALL TIMES
 - B. SAMPLE REQUIRED FOR TRANSFER
4. MATERIALS BACK-FLOWING FROM MIX VESSELS TO STORAGE VESSELS
 - A. HIGHER N₂ PRESSURE ON STORAGE TANKS
 - B. AUTOMATED BLOCK VALVES

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ETHYLENE PURIFICATION

I. MATERIALS

ETHYLENE
SILICA GEL
KATALCO
NITROGEN

II. CONCERNS

A. OVERHEATING KATALCO, SILICA BEDS DURING PRELOADING

1. ALARMS AT 100 C (SILICA GEL) AND 120 C (KATALCO)
2. REGULATOR ON PRELOAD LINES (SILICA BEDS)
3. LOW PRESSURE PRELOAD LINE (KATALCO)
4. HV'S WHICH OPEN TO THE FLARE ON THE SILICA BEDS
5. PSV'S

B. COMPRESSOR INCIDENTS (E.G. ETHYLENE DECOMPOSITION, ETC...)

1. HIGH TEMPERATURE SHUTDOWN
2. LOW SUCTION PRESSURE SHUTDOWN
3. HIGH PRESSURE SHUTDOWN
4. HIGH VIBRATION SHUTDOWN

FLAMMABILITY: ETHYLENE 2.7% TO 36.0 % IN AIR

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REACTION AREA

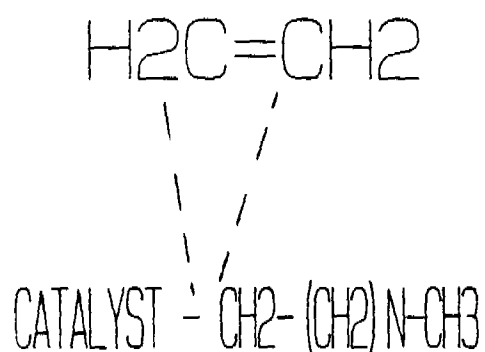
A. REACTION AREA RAW MATERIAL LIST

1. ETHYLENE
2. SOLVENT (ISOPAR E)
3. HYDROGEN
4. COOLING AND CHILLED WATER
5. TRIETHYL ALUMINUM (ATE)
6. PREMIX CATALYST
7. CALCIUM STEARATE
8. MINERAL OIL
9. NITROGEN

B. FLAMMABLE MATERIALS AND EXPLOSIVE LIMITS

1. ETHYLENE (3.0 TO 34.0%)
2. SOLVENT (0.9 TO 7.0%)
3. HYDROGEN (4.1 TO 74.2%)
4. ATE (PYROPHORIC IF > 15% BY WEIGHT)
5. CALCIUM STEARATE
6. PREMIX CATALYST (IE SOLVENT
0.9 TO 7.0%)

ETHYLENE POLYMERIZATION



HEAT OF REACTION: 1470 BTU/LB
OF POLYETHYLENE

1. LOW PRESSURE REACTION (405-500 PSIG)
2. REACTOR TEMPERATURES 180-200 C
3. CONVERSION GREATER THAN 90%
4. REACTION STOPPED BY DEACTIVATING CATALYST

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POTENTIAL PROBLEMS/PREVENTATIVE METHODS

1. UNCONTROLLED TEMPERATURE RISS IN REACTORS
 - A. CATALYST BECOMES INACTIVE AT HIGH TEMPERATURES
 - B. CAPABILITY OF STOPPING CATALYST PUMP FROM CONTROL ROOM
 - C. LARGE SOLVENT FLOW ACTS AS COOLANT
2. TUBE LEAK ON REACTOR PRECOOLERS
 - A. ETHYLENE/SOLVENT MIXTURE WILL FILL UP CHILL WATER TANK
 - B. FLAMMABLE MIXTURE FORMS IN VAPOR SPACE OF COOLING TOWERS
PREVENTATIVE METHOD:

COMBUSTIBLE GAS DETECTORS IN VAPOR SPACE OF CHILLED WATER AND COOLING TOWER - ALARMED IN CONTROL ROOM
3. REACTOR OVERPRESSURES
 - A. REDUNDANT HIGH PRESSURE ALARM
 - B. DUAL SAFETY VALVE ON EACH REACTOR WITH FLOW PROBES TO D212/222
 - C. AUTOMATIC DUMP VALVE ON BOTTOM OF REACTORS TO D212/222

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4. REACTOR THERMOCOUPLE FAILURE--READ 0

- A. REACTION WILL BEGIN TERMINATION
BECAUSE INCREASED TEMPERATURE WILL
DEACTIVATE CATALYST
- B. REDUNDANT THERMOCOUPLES THROUGHOUT
REACTORS

5. REACTOR SEAL FAILURE

- A. INTERNAL LEAKAGE
- B. EXTERNAL LEAKAGE

PREVENTATIVE METHODS

- A. MINERAL OIL WILL LEAK INTO REACTORS.
NO REACTION WILL TAKE PLACE
- B. MINERAL OIL LEAKS OUT BEFORE COMPLETE
FAILURE; COMBUSTIB GAS ANALYZERS
LOCATED NEAR REACTOR SEALS
- C. FLOW INDICATION ON MINERAL
OIL TO SEALS

6. FLAMMABLE MATERIAL

A. COMBUSTIBLE GAS DETECTORS LOCATED
THROUGHOUT AREA

B. DELUGE SYSTEM COVERS AREA

ATE EXPOSURE TO AIR

A. SMALL LEAK WILL NOT IGNITE.
ATE REACTS WITH MOISTURE IN
AIR FASTER THAN SOLVENT
VAPORIZES AND GIVES
PYROPHORIC MIXTURE.

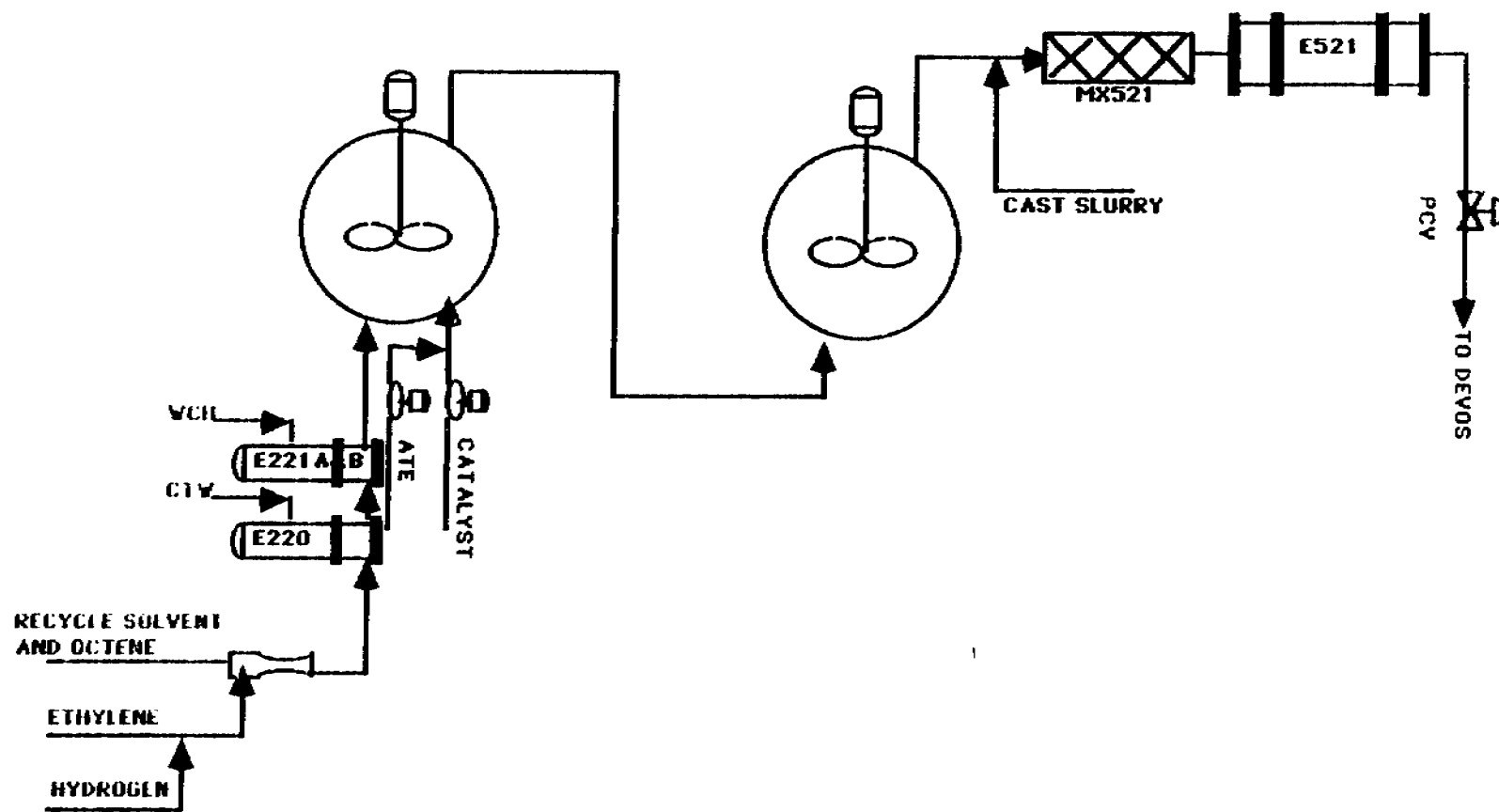
B. LINE OPENING-SOLVENT FLUSH
PROCEDURE FOLLOWED BEFORE
OPENING

C. LARGE LEAK-WATER MIST FIRE
PROTECTION SYSTEM

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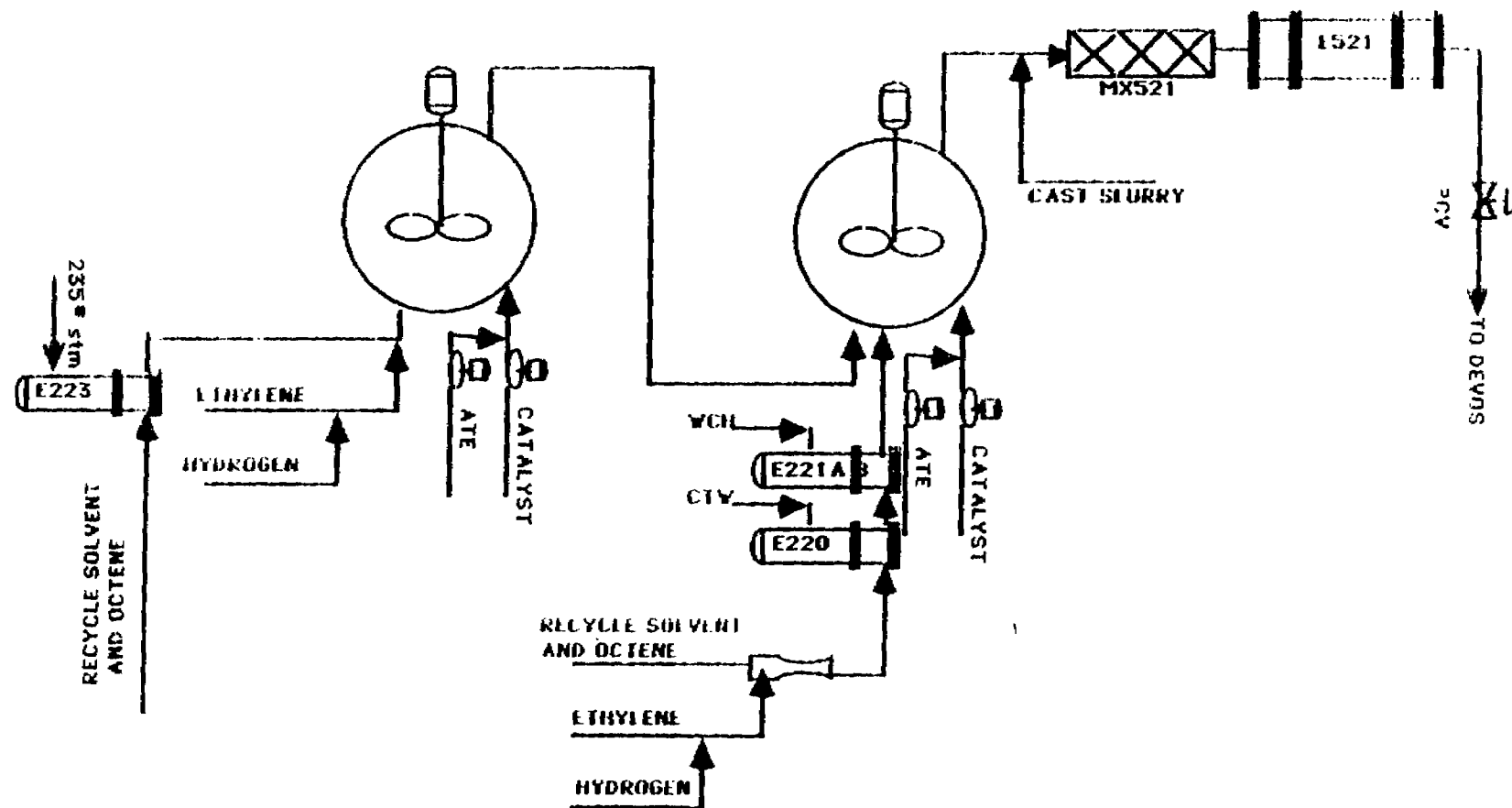
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5. ngle
 NORMAL REACTOR ~~DEA~~ POST CONFIGURATION



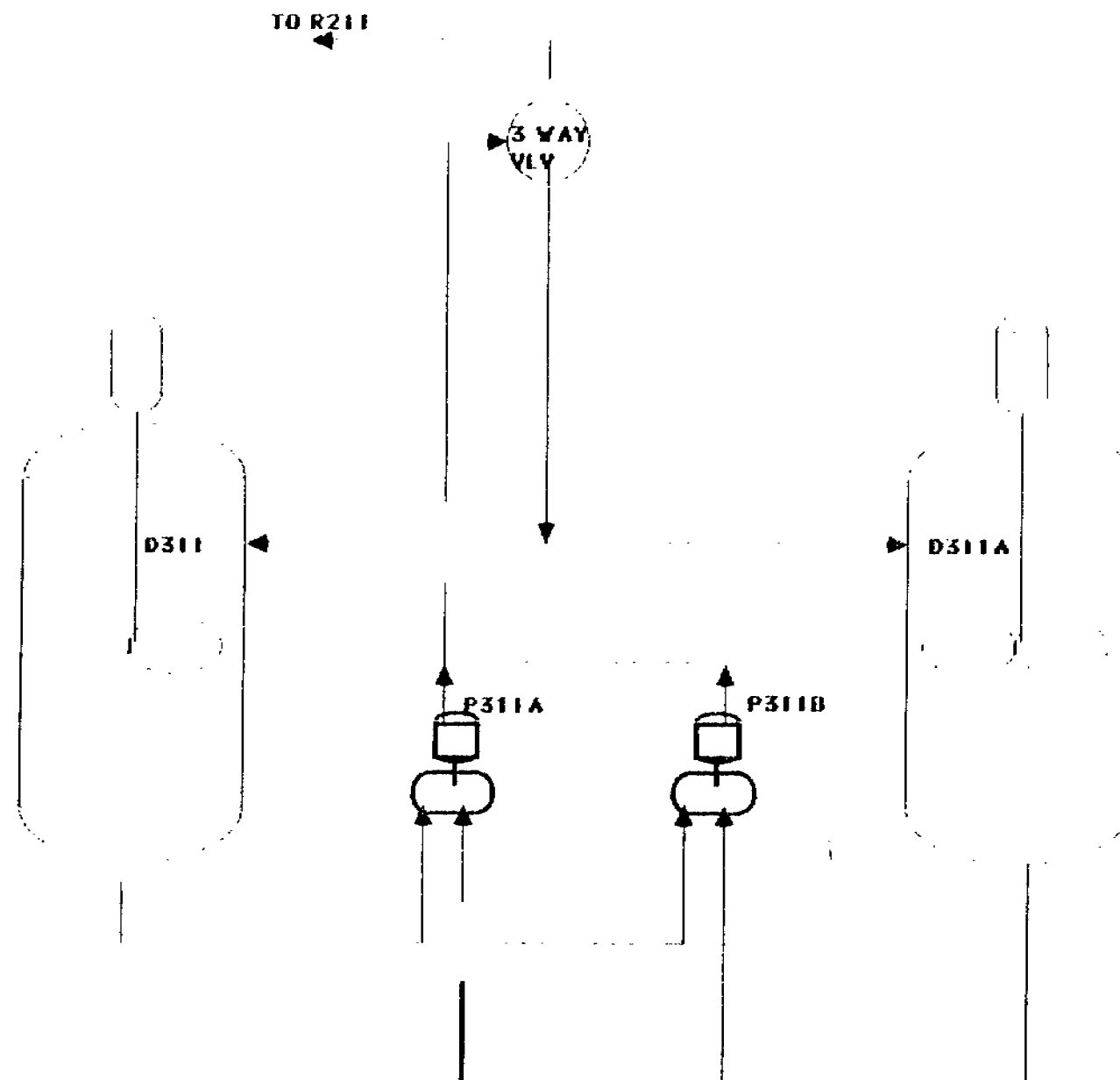
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DUAL REACTOR CONFIGURATION



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TRI LT CATALYST FEED SYSTEM



CALCIUM STEARATE AREA RAW MATERIALS

CALCIUM STEARATE

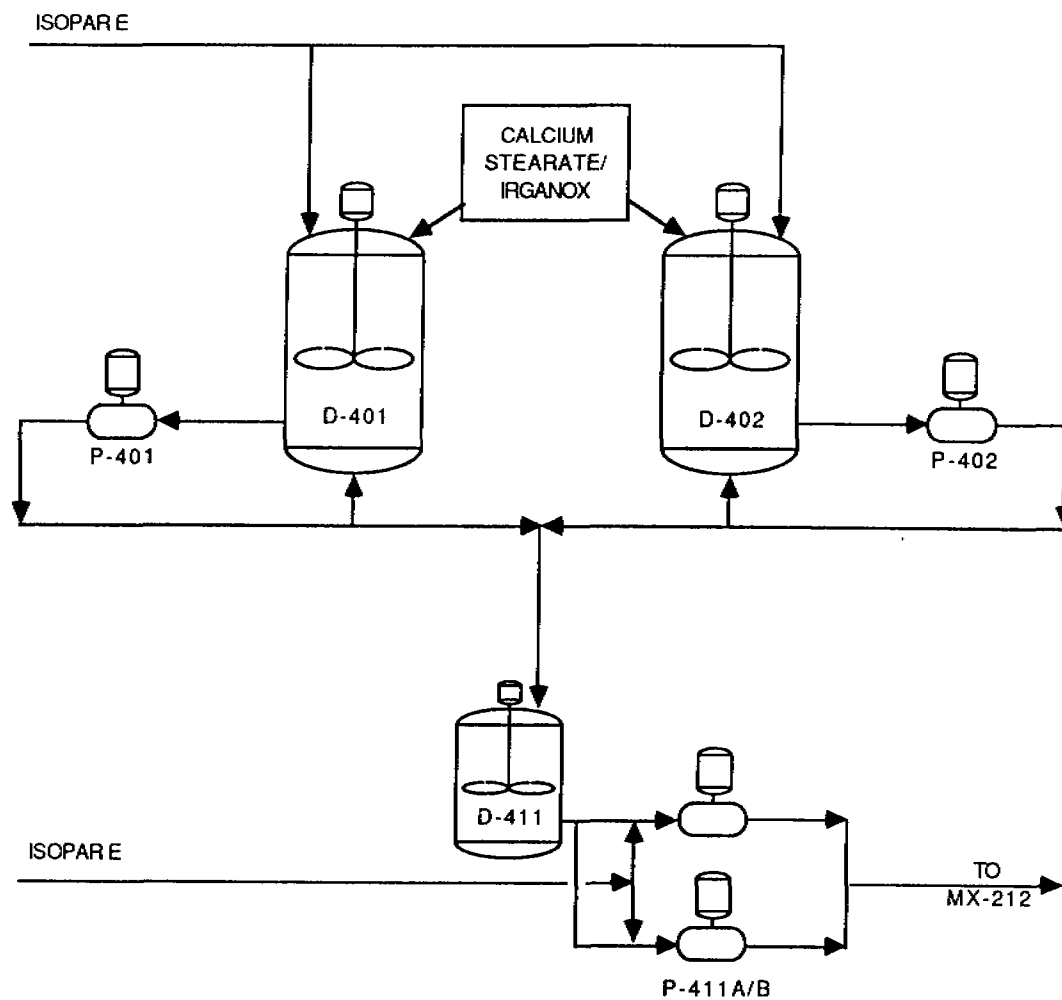
IRGANOX 1010

ISOPAR E

NITROGEN

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CALCIUM STEARATE SYSTEM SCHEMATIC

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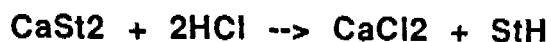
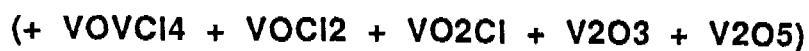
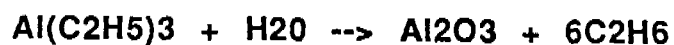
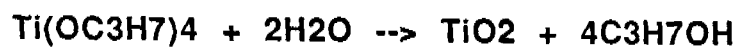
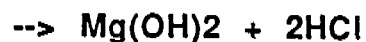
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CALCIUM STEARATE AREA

CATALYST DEACTIVATION



P = growing polymer chain



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CALCIUM STEARATE AREA

POTENTIAL PROBLEMS/PREVENTIVE MEASURES

=> DUST EXPLOSION

- * N2 PADS ON UNLOADING LINES AND VESSELS
- * ALL EQUIPMENT GROUNDED

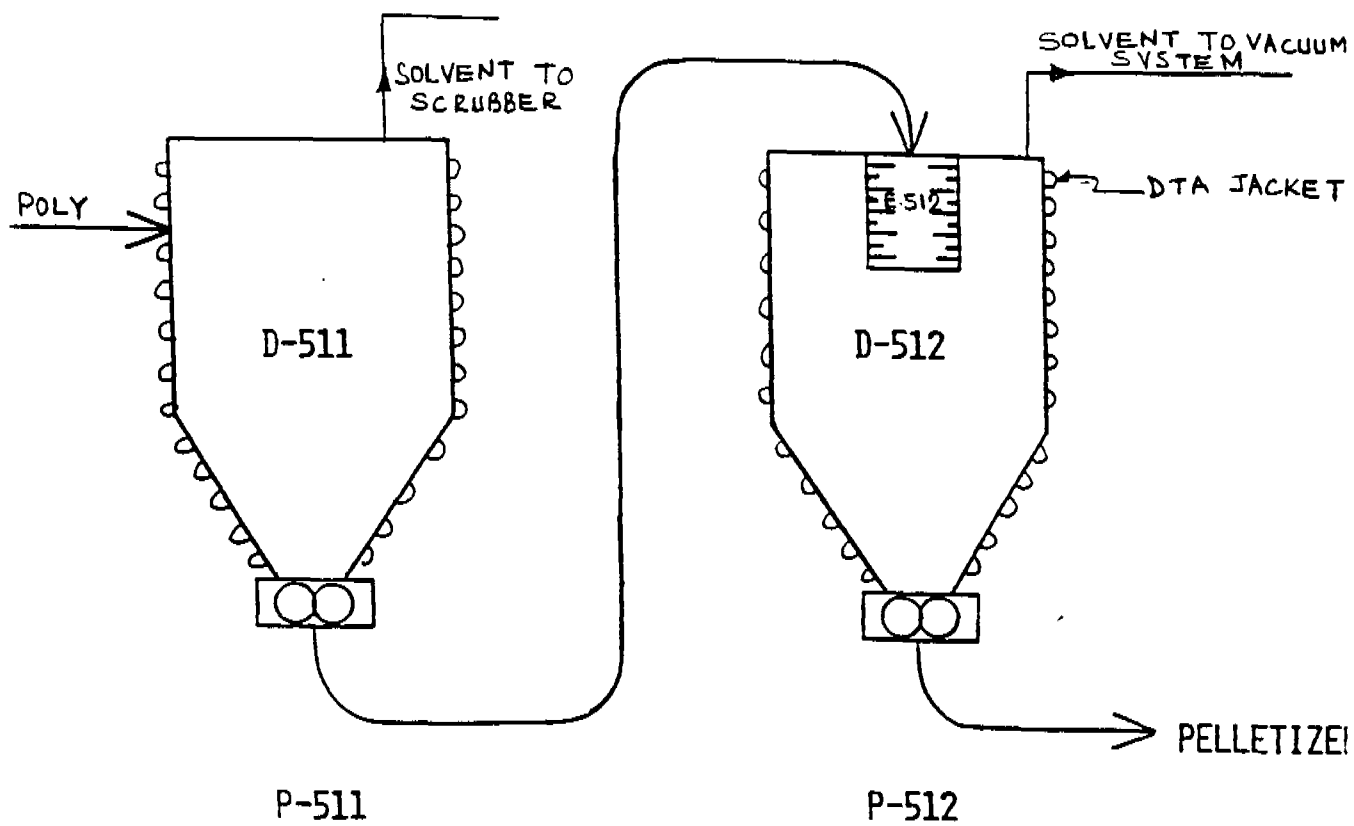
=> SOLVENT/CALCIUM STEARATE EXPLOSIVE MIXTURE IN UNLOADING LINES

- * N2 FLOW IN UNLOADING LINES REQUIRED TO OPEN SLIDE VALVES
- * LOW PRESSURE IN TANK REQUIRED TO OPEN SLIDE VALVES

=> LOSS OF FLOW TO PROCESS

- * LOW FLOW ALARM
- * DEVIATION ALARM (MICROMOTION VERSUS WEIGH CELLS)
- * WEEKLY ANALYSIS

DEVOLATILIZERS



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DEVOLATILIZATION

POLYMER ENTER THE 1ST DEVO. D511 TANGENTIALLY ON THE SIDE, CAUSING SPIRAL EFFECT TO HELP KEEP POLYMER FROM BEING CARRIED OVERHEAD WITH SOLVENT VAPOR. 98% OF THE SOLVENT IS VAPORIZED IN 1ST DEVO. THE POLYMER IS PUMPED INTO THE SECOND DEVO. D512, BY THE FIRST GEAR PUMP (P511) THROUGH THE PLATE HEAT EXCHANGER E 512. THIS EXCHANGER IS HEATED WITH DTA AT 260 DEGREE CENTIGRADE.

IN SECOND DEVO (D512) PRESSURE IS REDUCED TO UNDER 5MM HG ABSOLUTE REMAINING SOLVENT IS VAPORIZED AND FLOWS TO THE TOP OF THE DEVO WHERE IT IS REMOVED THROUGH THE VACUUM SYSTEM.

THE SECOND GEAR PUMP P512 PUMPS THE POLYMER FROM THE SECOND DEVO D512 THROUGH THE STATIC MIXER MX512 TO THE PELLETIZER.

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POTENTIAL PROBLEMS/AND PRECAUTION

- 1) OVERFILL OF DEVOS
 - (A) HIGH LEVEL SWITCH PROVIDED TO ALARM AT 60% OF DEVO LEVEL
- 2) RESTRICTED DISCHARGE LINE ON PUMPS P511/P12
 - (A) HIGH DISCHARGE PRESSURE SHUTDOWN
 - (B) HIGH GEAR BOX TORQUE SHUTDOWN
 - (C) LOW TEMPERATURE ON DISCHARGE LINE OF BOTH PUMPS PREVENTS STARTUP
- 3) TUBE LEAK IN E512-DTA TO POLYETHYLENE
 - (A) NO REACTIVE CHEMICAL PROBLEM BUT WILL CREATE PROCESS PROBLEM
- 4) HIGH DEVO JACKET DTA PRESSURE
 - (A) BOTH DEVO HAVE PSV'S THAT RELIEVE TO DTA STORAGE DRUM D-502

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PELLETIZING

MATERIALS HANDLED

- 1) WATER
- 2) DOWTHERM[®]
- 3) POLYMER (PELLETS)

REACTIVE CHEMICAL HAZZARD: NONE

SAFETY PRECAUTION

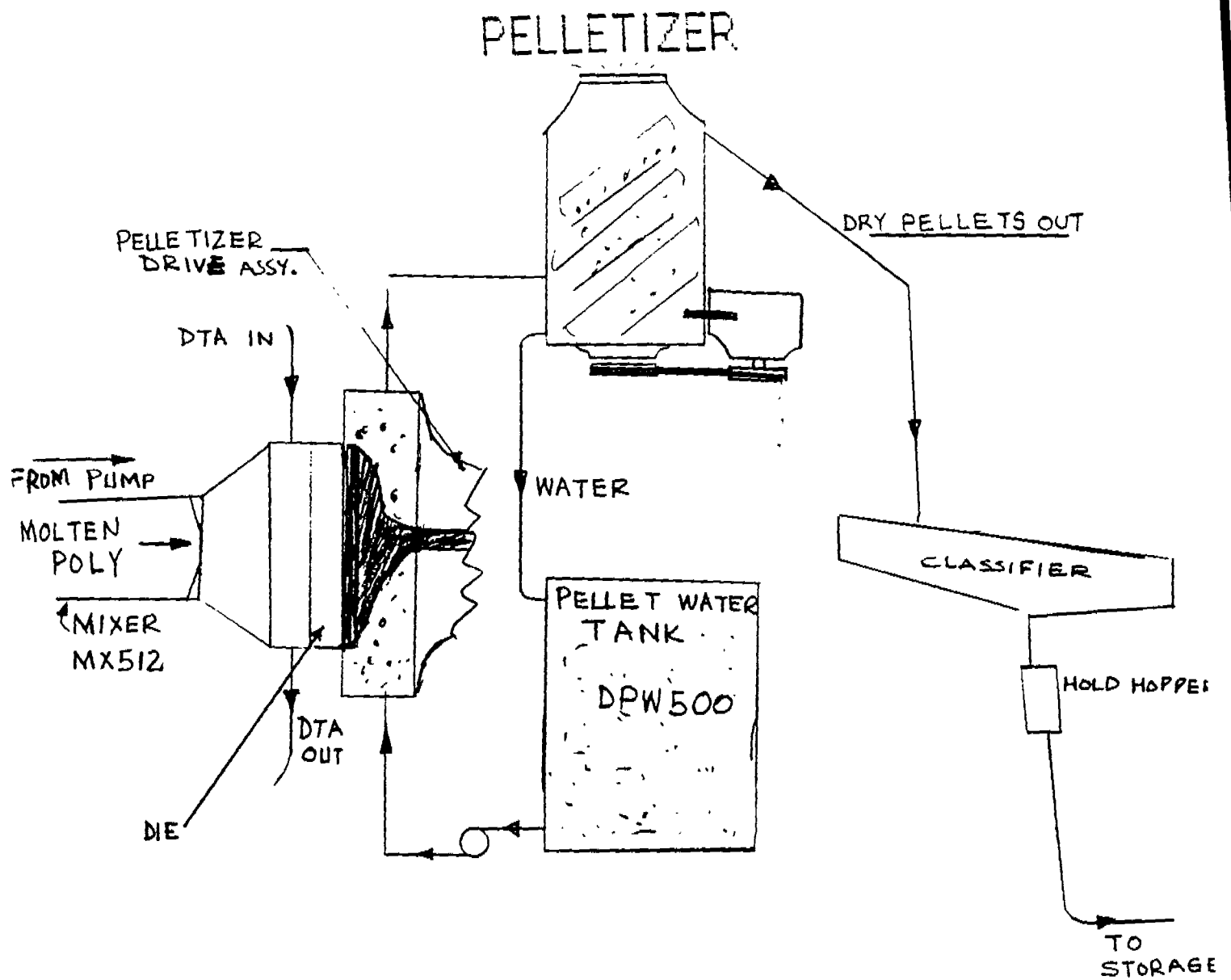
MX512 (STATIC MIXER) UPSTREAM OF PELLETIZER HAS RUPTURE DISC IN CASE OF EXCESSIVE PRESSURE.

A GUARD IS PROVIDED OVER THE DISC TO PREVENT INJURY TO PERSONNEL IN CASE OF RELEASE.

SHOULD DTA LINE TO DIE OPEN TO THE PELLET WATER, NO REACTIVE CHEMICAL HAZZARD IS PRESENT.

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GOS 5/12/89

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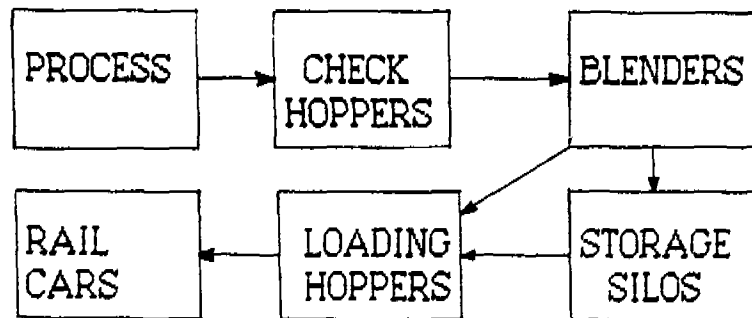
PELLETIZER OPERATION

POLYMER FROM GEAR PUMP ENTERS THE PELLETIZER WHERE IT GOES THROUGH A DIE PLATE WITH SEVERAL HOLES (APPROX. 1096 HOLES AND 0.125" DIA.) AFTER POLY IS FORCED THROUGH THE HOLES, IT ENTERS THE WATER CHAMBER WHERE IT IS CUT INTO PELLETS BY A ROTATING CUTTER ASSEMBLY POSITIONED AT DIE FACE. HOT DOWTHERM ON THE DIE RINGS KEEP POLY HOT. WATER, ENTERING THROUGH BOTTOM OF WATER BOX, RAPIDLY COOLS THE POLY AS THEY ARE CUT AND TRANSFERS IT TO THE SPIN DRIER WHERE THE WATER IS REMOVED AND RETURNED TO THE WATER STORAGE TANK DPW 500. THE PELLETS ARE FORWARDED TO THE CLASSIFIER WHERE IT IS SCREENED TO THE RIGHT SIZE. FROM THE CLASSIFIER, THE PELLETS ARE TRANSFERED TO THE STORAGE SILOS.

GOS 5-11-89

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MATERIAL HANDLING SYSTEM-



CONCERNS:

- * Dust Explosions
- * Solvent Buildup in the Check Hoppers

SAFEGUARDS:

- * Combustible gas detectors in all hoppers and Silos
- * Air purge on all hoppers and Silos
- * Optional Nitrogen purge on check hoppers
- * Calculated solvent content based on process conditions

JS
5/12/89

ADDITIVES

ADDITIVES ADDED VIA EXTRUDER

HEMAMIDE E D

IRGANOX

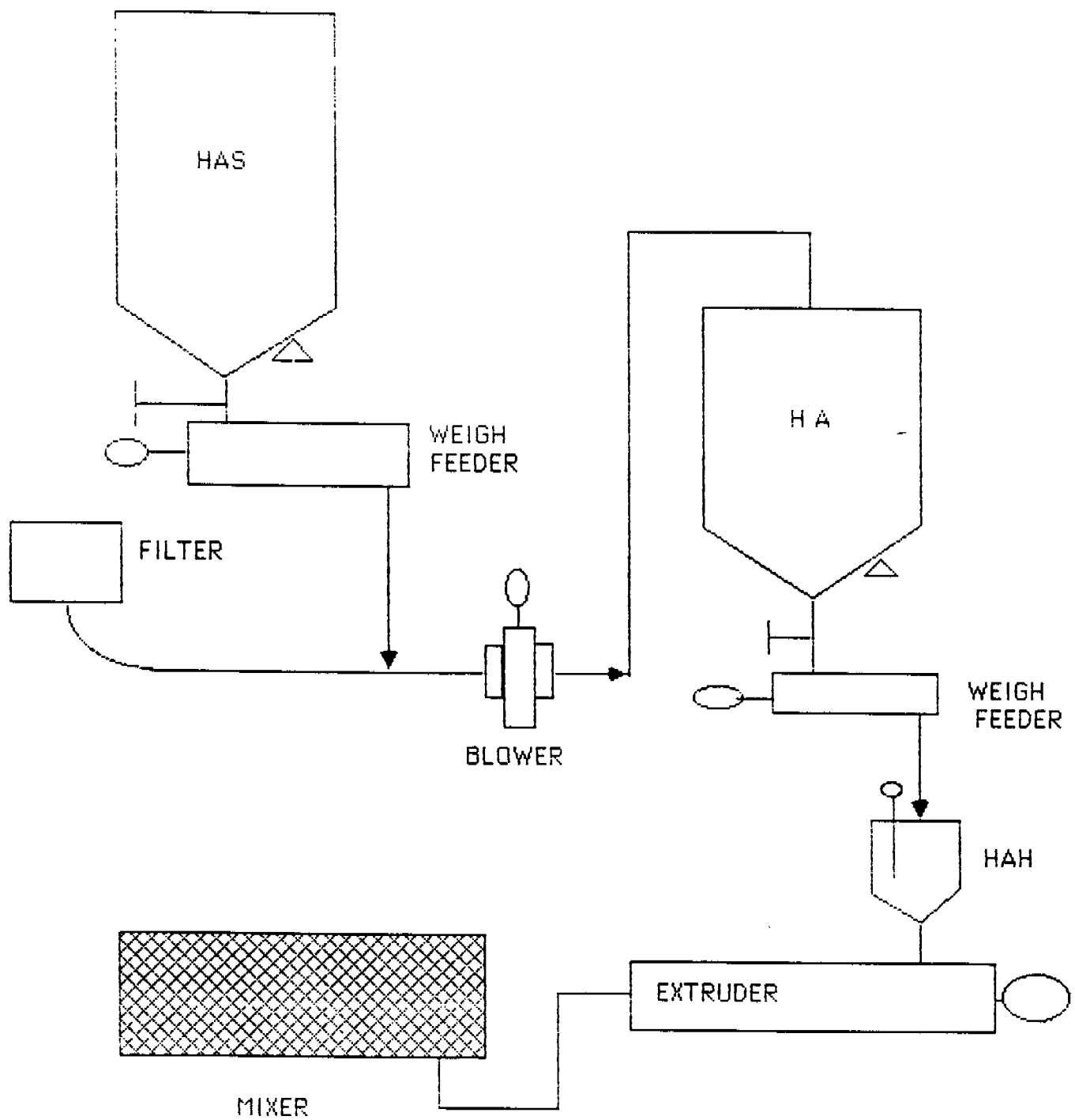
IRGAFOS

SUPERFLOSS

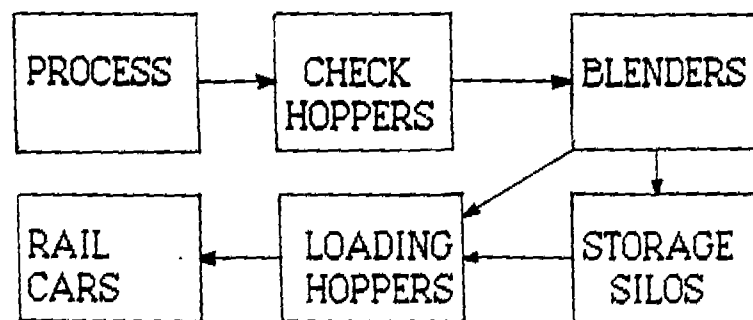
II. CONCERNS

EXTRUDER OVERPRESSURING - PROTECTED BY RUPTURE DISK AND HIGH
PRESSURE SHUTDOWN

ADDITIVES ARE NON-REACTIVE WITH PLANT CHEMICALS



MATERIAL HANDLING SYSTEM-



CONCERNS:

- * Dust Explosions
- * Solvent Buildup in the Check Hoppers

SAFEGUARDS:

- * Combustible gas detectors in all hoppers and Silos
- * Air purge on all hoppers and Silos
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JS
5/12/89

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ADDITIVES

ADDITIVES ADDED VIA EXTRUDER

KEMAMIDE E H

IRGANOX

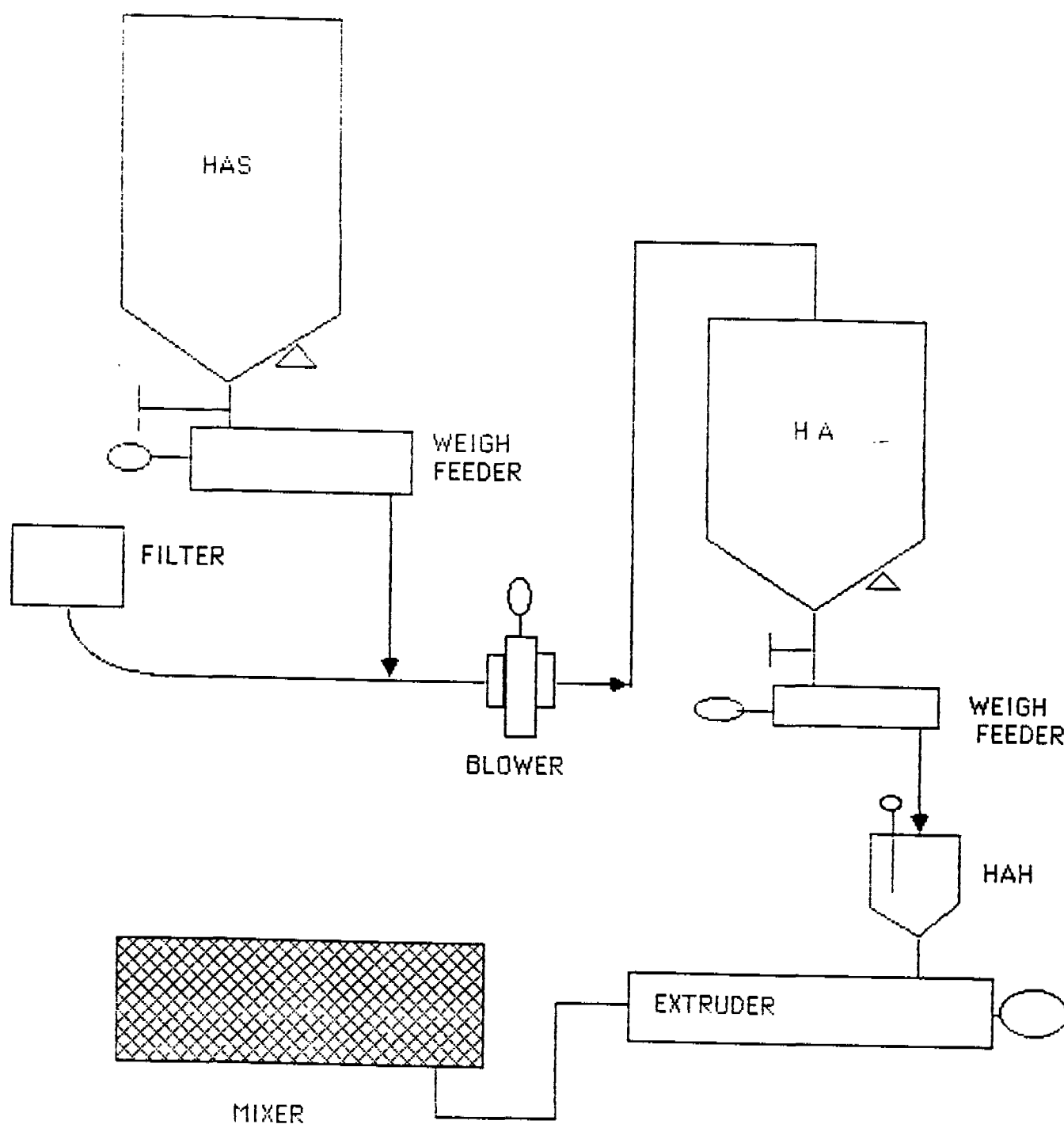
IRGAFOS

SUPERFLOSS

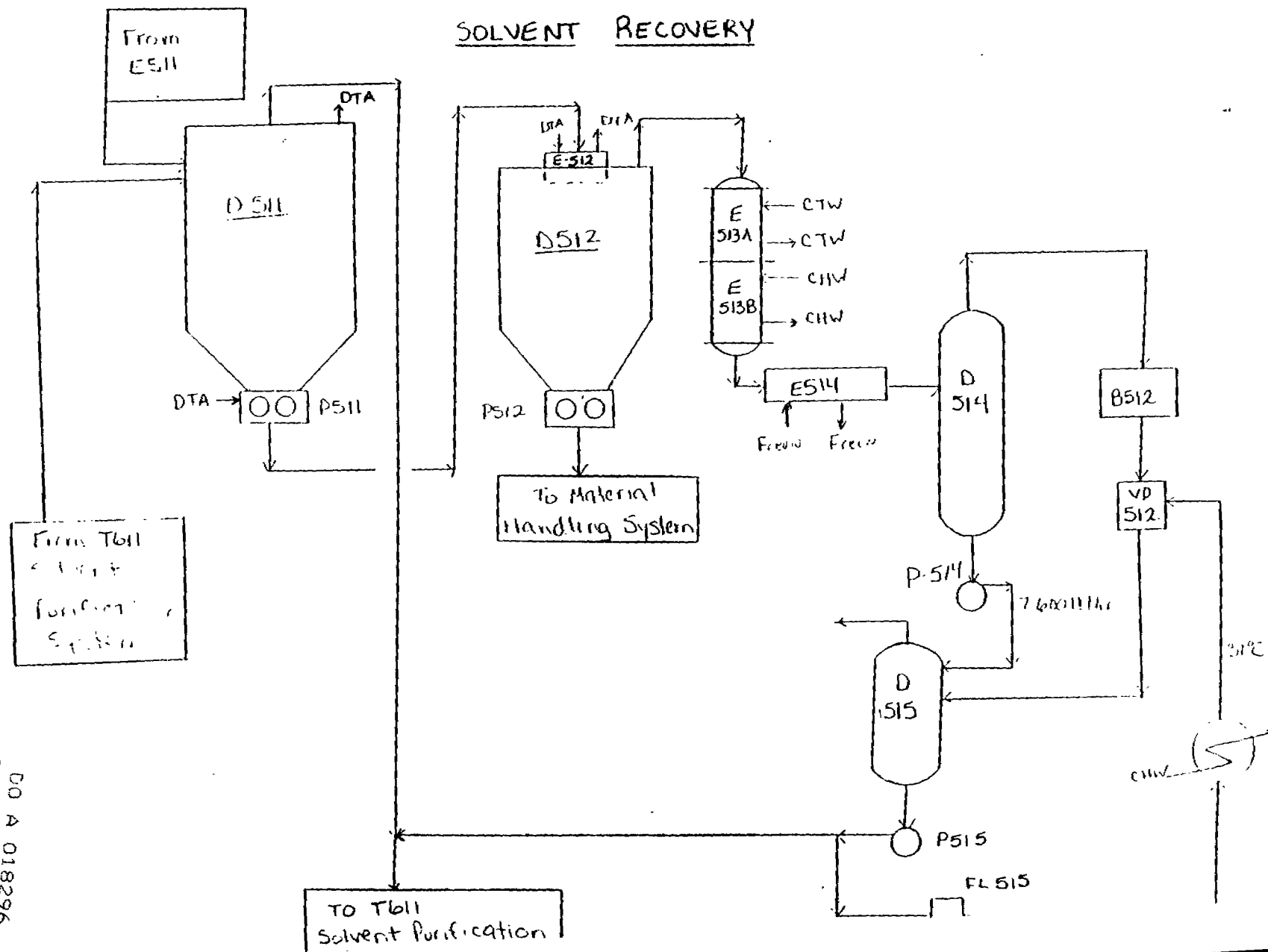
II. CONCERNS

EXTRUDER OVERPRESSURING - PROTECTED BY RUPTURE DISK AND HIGH
PRESSURE SHUTDOWN

ADDITIVES ARE NON-REACTIVE WITH PLANT CHEMICALS



SOLVENT RECOVERY



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SOLVENT RECOVERY

CONCERNS

I. TUBE LEAK IN E-513A/B - WATER INTO SOLVENT

A. NO REACTION WILL TAKE PLACE. PROCESS EFFICIENCIES WILL BE AFFECTED. COULD RESULT IN A PLANT SHUTDOWN

II. TUBE LEAK IN E-514 - REFRIGERANT 22 INTO SOLVENT

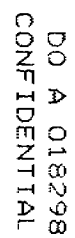
A. NO REACTION WILL TAKE PLACE. PROCESS EFFICIENCIES WILL BE AFFECTED.

III. FLAMMABLE

A. GAS DETECTORS LOCATED THROUGHOUT AREA

B. FOAM AND WATER AVAILABLE IN AREA

X. SHEN



SOLVENT PURIFICATION

CONCERNS

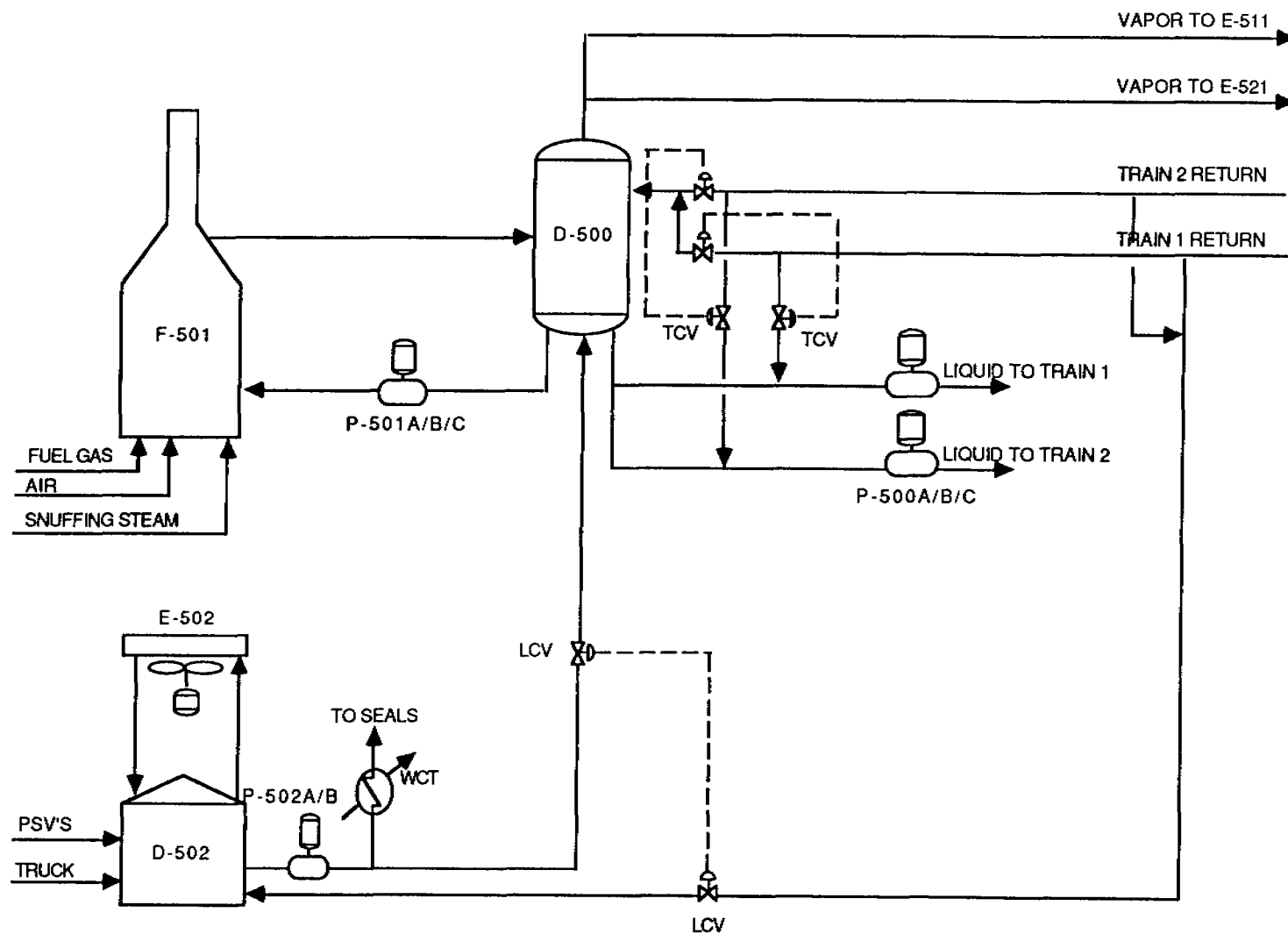
1. E-617 TUBE LEAK SOLVENT / OCTENE INTO WATER
 - A. LEAK WILL BE DETECTED BY COMBUSTIBLE ANALYZERS IN CHILL WATER
2. E-611 TUBE LEAK - SOLVENT INTO CONDENSATE SYSTEM
 - A. COMBUSTIBLE GAS DETECTOR ON CONDENSATE DRUM
 - B. PRESSURE RELIEF VALVE ON CONDENSATE SURGE DRUM
3. E-613 TUBE LEAK - SOLVENT INTO WATER SYSTEM
 - A. LEAK WILL BE DETECTED BY COMBUSTIBLE ANALYZERS IN COOLING TOWER
4. RE-611 TUBE LEAK - WATER IN SOLVENT
 - A. PROCESS EFFICIENCIES WILL BE EFFECTED
5. FLAMMABLES IN ENTIRE AREA
 - A. ANALYZERS NEAR PUMP AREA TO DETECT LEAKS
 - B. FOAM AND WATER AVAILABLE TO ENTIRE AREA
6. OVERHEATING MOLECULAR SIEVE BEDS
 - A. SOLVENT ABSORBS ANY HEAT THAT IS GENERATED
7. REACTIONS OR POTENTIAL REACTIONS
 - A. NONE

DOWTHERM AREA RAW MATERIALS

DOWTHERM A
FUEL GAS/OFF GAS
COOLING TOWER WATER
235 PSIG STEAM
NITROGEN
AIR

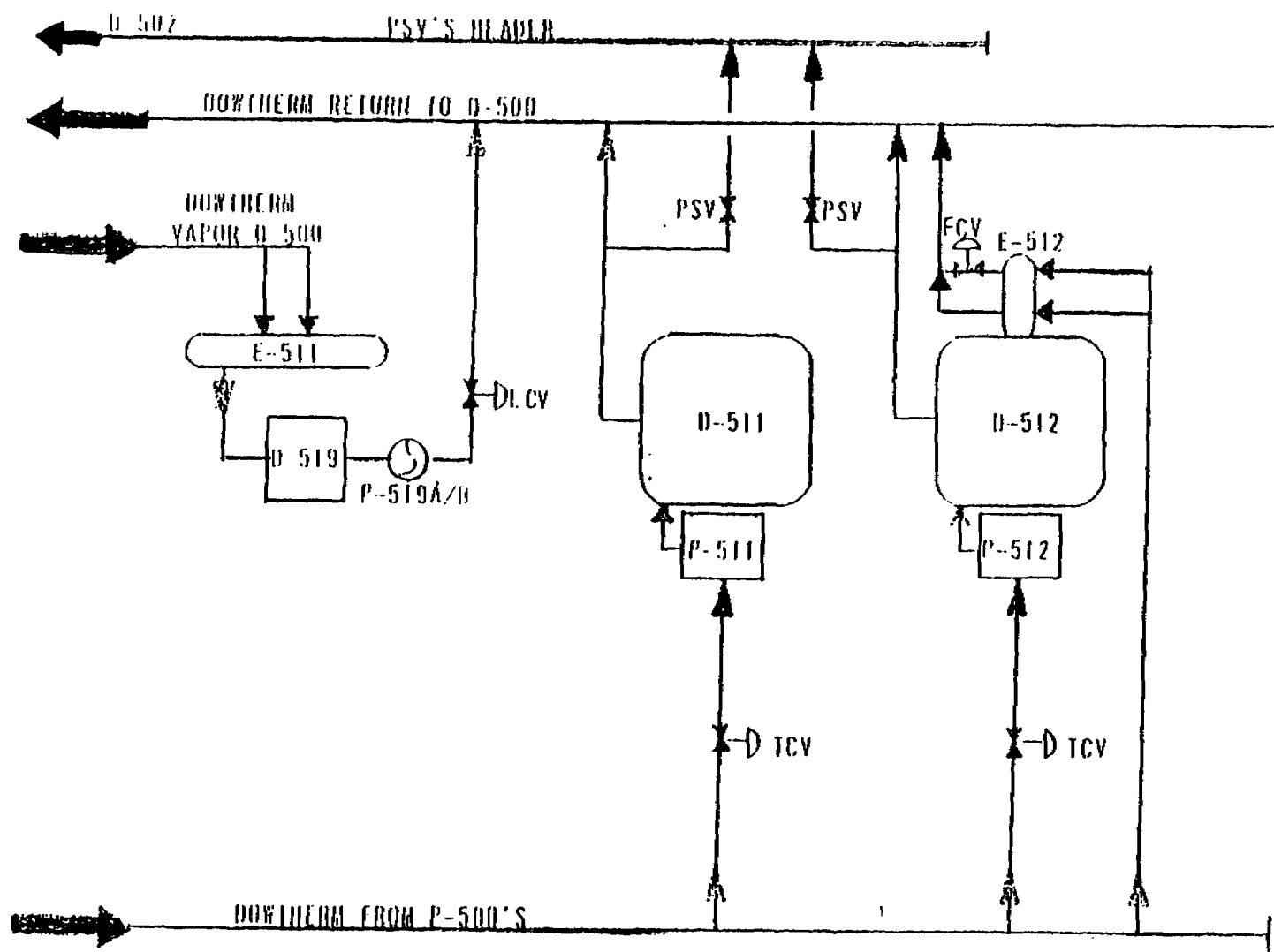
KES 5/11/89

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DOWTHERM AREA SCHEMATIC

KES
5/13/89



DO A 018302
CONFIDENTIAL

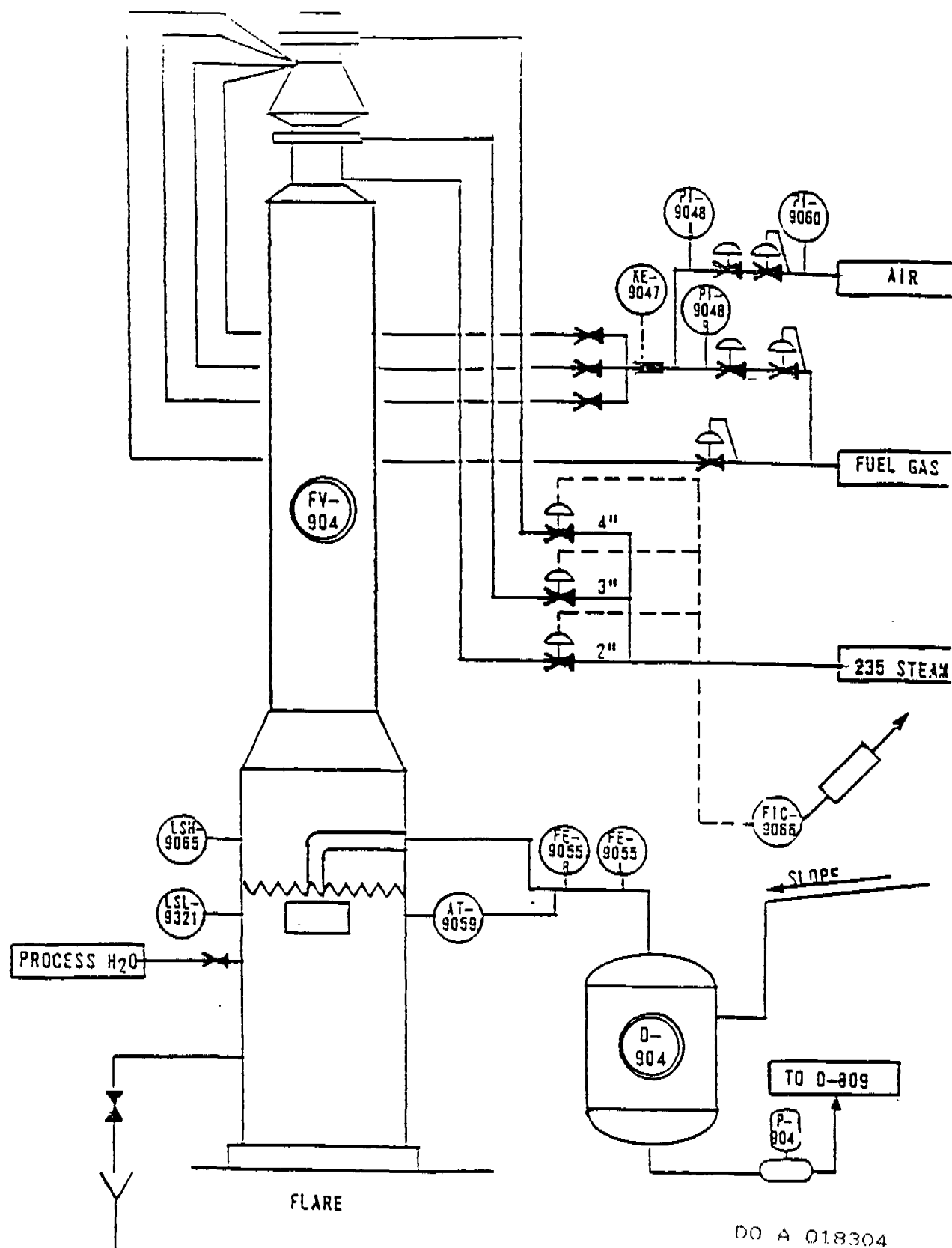
DOWTHERM AREA

POTENTIAL PROBLEMS/PREVENTIVE METHODS

1. LOSS OF FLAME IN FURNACE
 - A. DUAL PILOT DETECTORS/DUAL FLAME DETECTORS
 - B. AUTOMATIC FURNACE TRIP
2. EXPLOSIVE MIXTURE IN FURNACE WHEN LIGHTING
 - A. FURNACE PURGED AUTOMATICALLY PRIOR TO LIGHTING SEQUENCE
 - B. AUTOMATIC DOUBLE BLOCK AND BLEED ON MAIN/PILOT GAS
3. TUBE RUPTURE INSIDE FURNACE
 - A. INTERNAL INSPECTION OF FURNACE TUBES
 - B. REMOTELY OPERABLE VALVE FOR SNUFFING STEAM
 - C. REMOTE EMERGENCY SHUTDOWN
 - D. REMOTELY OPERABLE EBV'S ON FLASH DRUM
 - E. HIGH CONVECTION TEMPERATURE TRIP
4. WATER LEAKAGE INTO SYSTEM DURING SHUTDOWN
 - A. TRIP ON HIGH PRESSURE IN FLASH DRUM
 - B. PSV'S ON FLASH DRUM
 - C. NON-CONDENSIBLE VENTS OPEN TO STORAGE TANK DURING STARTUP
5. PROCESS LEAK INTO E-511
 - A. HIGH PRESSURE ALARM ON E-511 SHELL SIDE
 - B. PSV'S TO PROTECT D-519 AND D-500
 - C. REMOTELY OPERABLE VALVE FOR ISOLATING E-511 SHELL FROM D-500

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FLARE

POSSIBLE PROBLEMS / PREVENTIVE MEASURES

1. LEAKAGE OF AIR INTO SYSTEM

PREVENTIVE MEASURE

- A. Nitrogen purge on each branch of flare header
- B. Oxygen analyzer
- C. Small positive pressure on flare

2. OUTSIDE SPILL WHICH COULD BE IGNITED BY FLARE

- A. Remotely operated steam valves to snuff pilot

3. HIGH OR LOW WATER LEVEL IN FLARE

- A. High and low level alarms
- B. High pressure alarms

Train 3 is designed for 320 MM lbs/yr

- Single-Post Reactor Configuration (No dual reactor products)
- 1.0 MI Products
- 49.66 Klbs/hr Ethylene
- 6:1 Solvent to Ethylene Ratio

Ethylene Feed Compressor - C-131

- Constant speed motor
- Pocket valves to control capacity (40,000 to 50,000 lbs/hr)
- Ability to upgrade to 60,000 lbs/hr

No High Speed Sundyne Pumps for solvent recirculation

- Byron Jacksons (low speed, high capacity)

Reactor Solvent Heater (E-232)

- Preheats solvent to the reactor with steam

Devolatilizer Preheaters (E-531's)

- Three exchangers, independent monitoring and control

Larger Devolatilizers (D-531 and D-532)

- 14 ft in diameter
- Steeper angled cone
- Sits on legs instead of hung from steel
- Tangential Entry to the first devolatilizer
- Vacuum system all welded to prevents air leaks

Latest Gear Pump Design and Instrumentation

- Hung on bottom flange of devolatilizer
- Rupture Disc on P-531 discharge to D-531

No Steam Generator (E-631) in recycle solvent system

Four Fin Fan exchangers (E-632's) in recycle solvent loop

Dewax Column (T-631)

- New design (16 trays with internal coalescer)
- Bottoms to Train 3 DTA Furnace, F-505

No wax filters before the Solvent Recovery Beds (No FL631's)

One set of Solvent Recovery Beds (Y-631's)

- Stacked bed
- Two Sections
- Canned blower (YB-631)
- * - Solvent collection drum (YD-632)
 - Solvent bed area bleeds piped to YD-632
- Beds are pumped empty using the YD-632 bottoms pump, P-634

Solvent/Ethylene Separation Drum (D-631)

- Larger than D-611/D-621
- No Train Solvent Storage Drum (no D-831)
 - Will use D-811/D-821
- Capacity to hold all of Train 3 solvent

Canned pumps in solvent and DTA return service (No external seal)

No recycle compressor (C-711/C-721 will handle recycle)

Pelletizer (K-531)

- New field panel design
- No screen pac

Pellet Water Exchangers (E-537A/B)

- Plate & Frame Exchangers

Pellet Water Filter (FL-537)

- Auto-Backwash

Production Weigh Belt Feeder (WF-531)

Only one HUH Transfer Blower (BACP-30)

- Backup is Check Hopper Transfer Blower (BACP-9B)

Additive Extruder

- Egan (Same as Train 1)
- Will add fluorlastmer capability after Startup

Check Hoppers

- Purge and transfer air collected and used in Train 3 DTA furnace, F-505

DTA Furnace (F-505)

- * - Burns bottoms from Dewax Column, T-631
- * - Collects vents from hoppers and uses as combustion air

ARU's

- Total Mod V Control

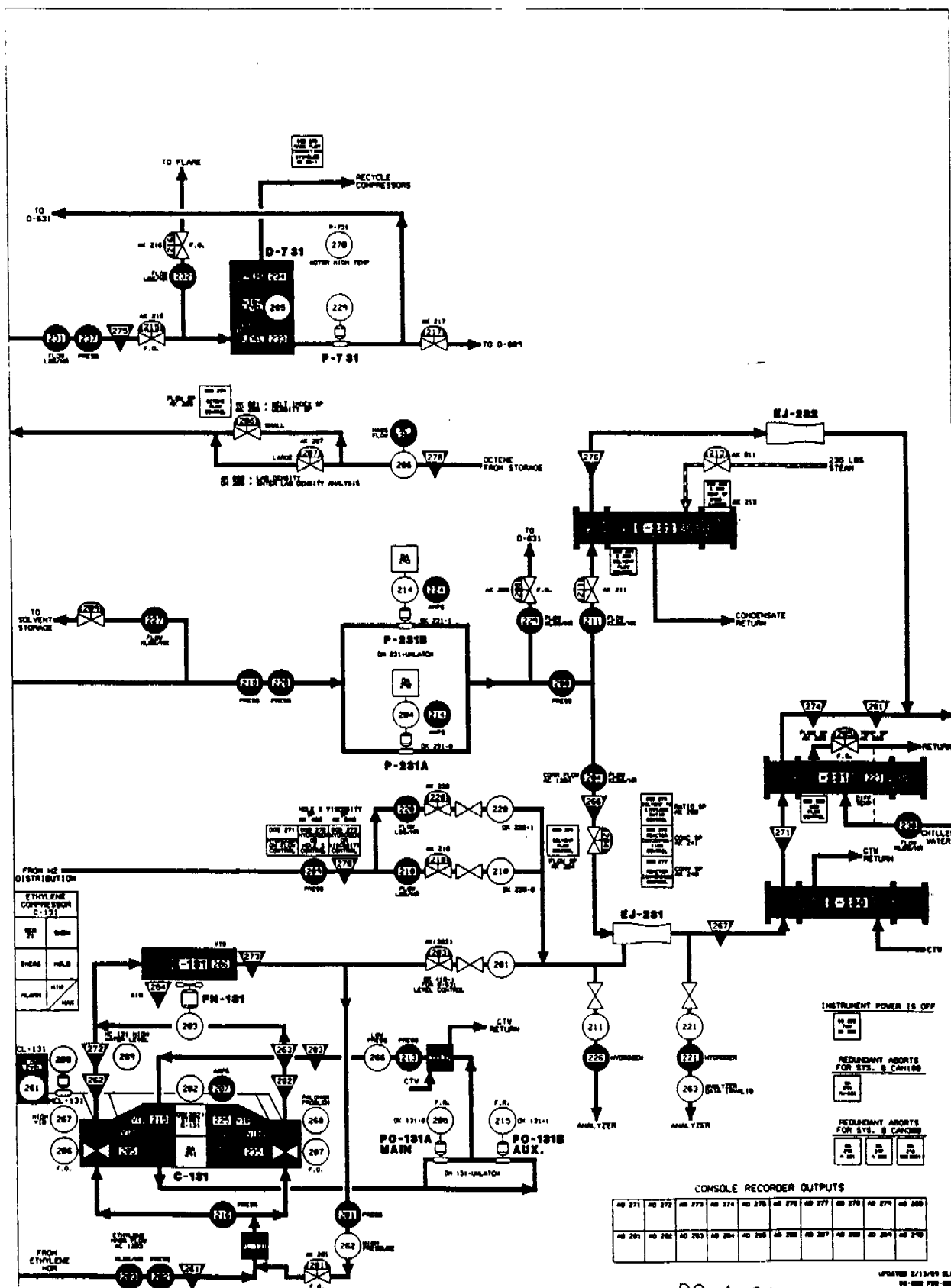
No freon compressors in the vacuum system

Hopper Truck Loading Facility (PMS)

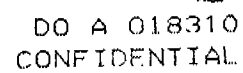
Solvent Storage

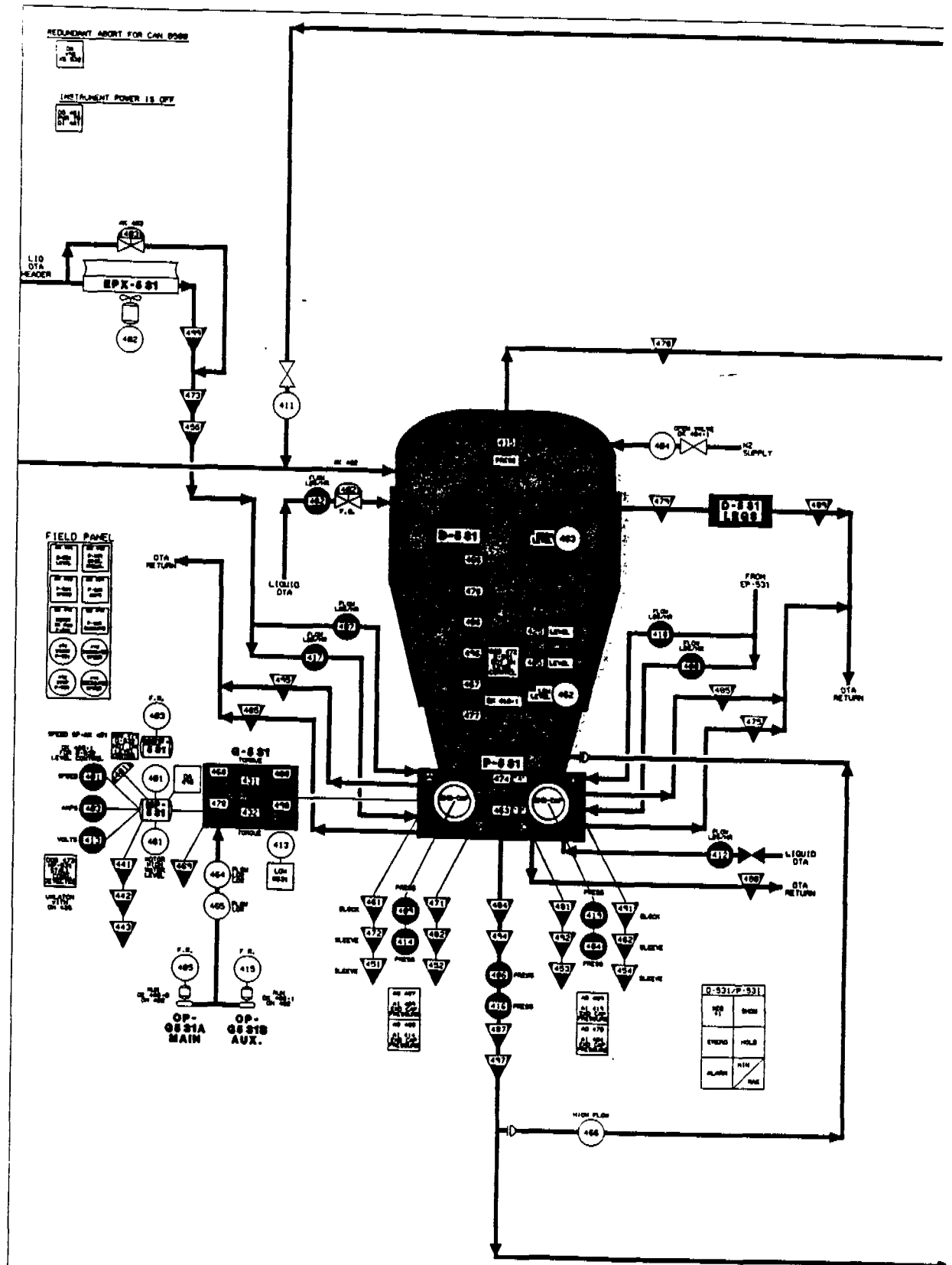
- Added a second fresh solvent bed, Y-801B
- Added a second fresh solvent pump, P-801B

* These items will be covered in more detail

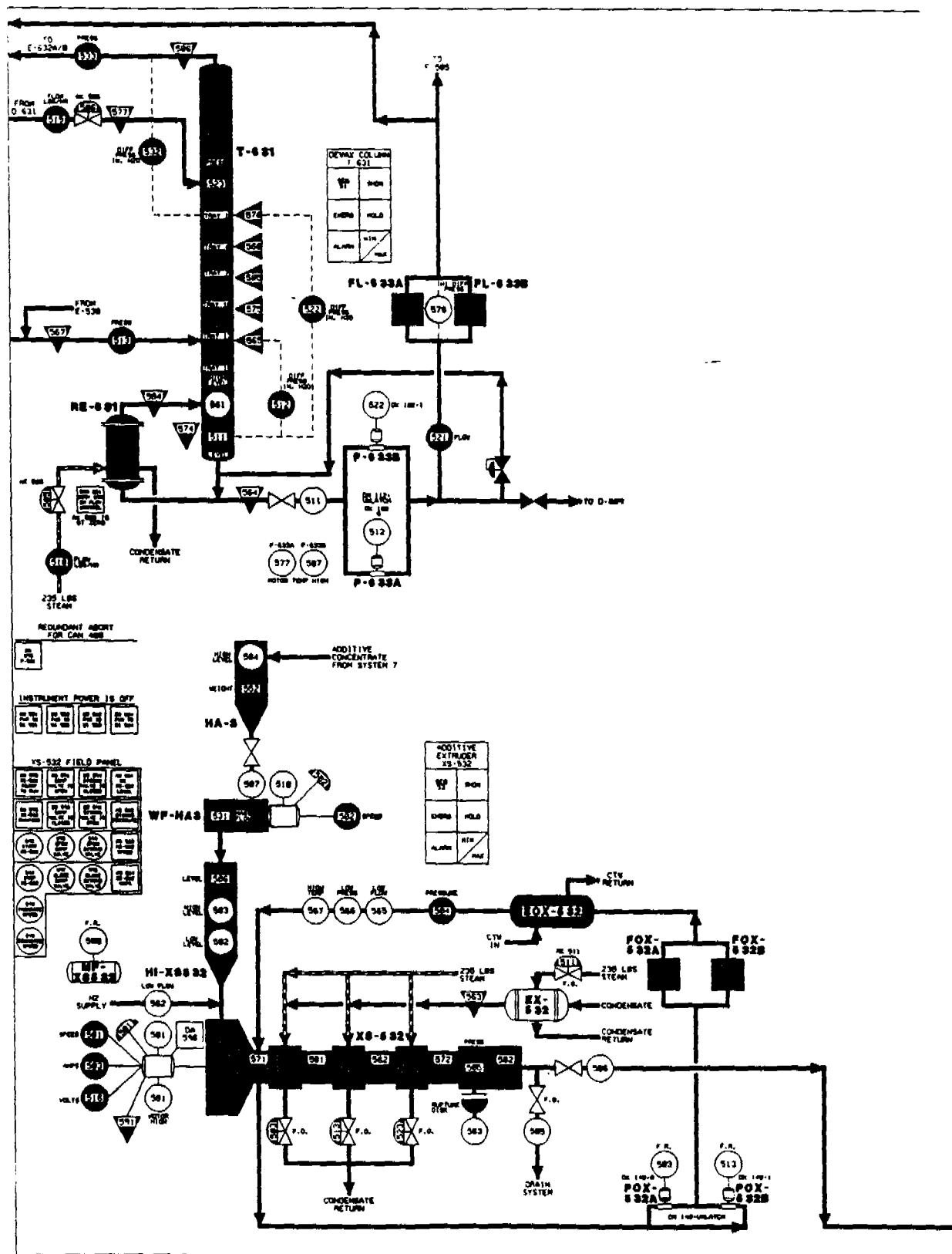


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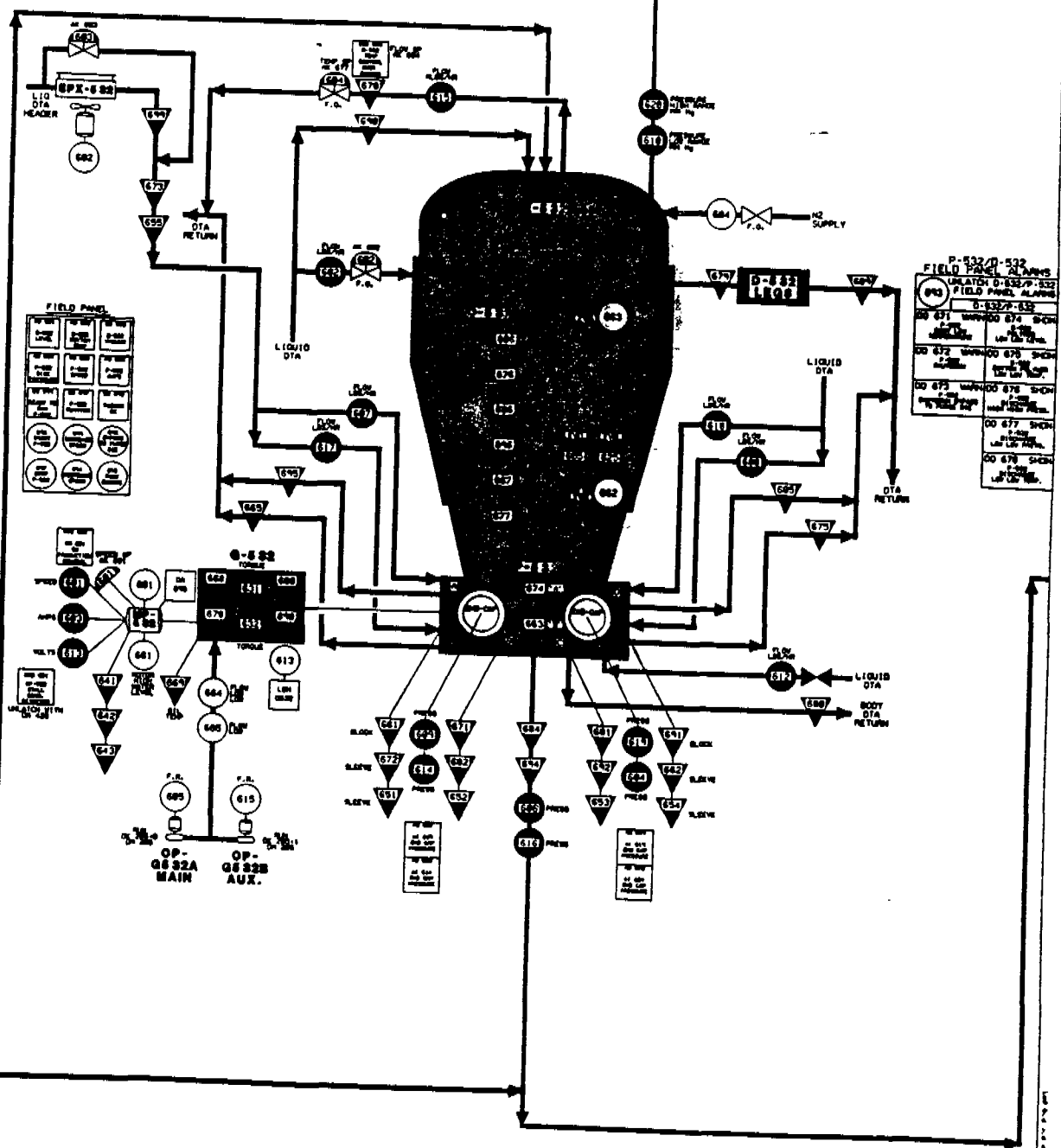
DO A 018311
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DO A 018312
CONFIDENTIAL

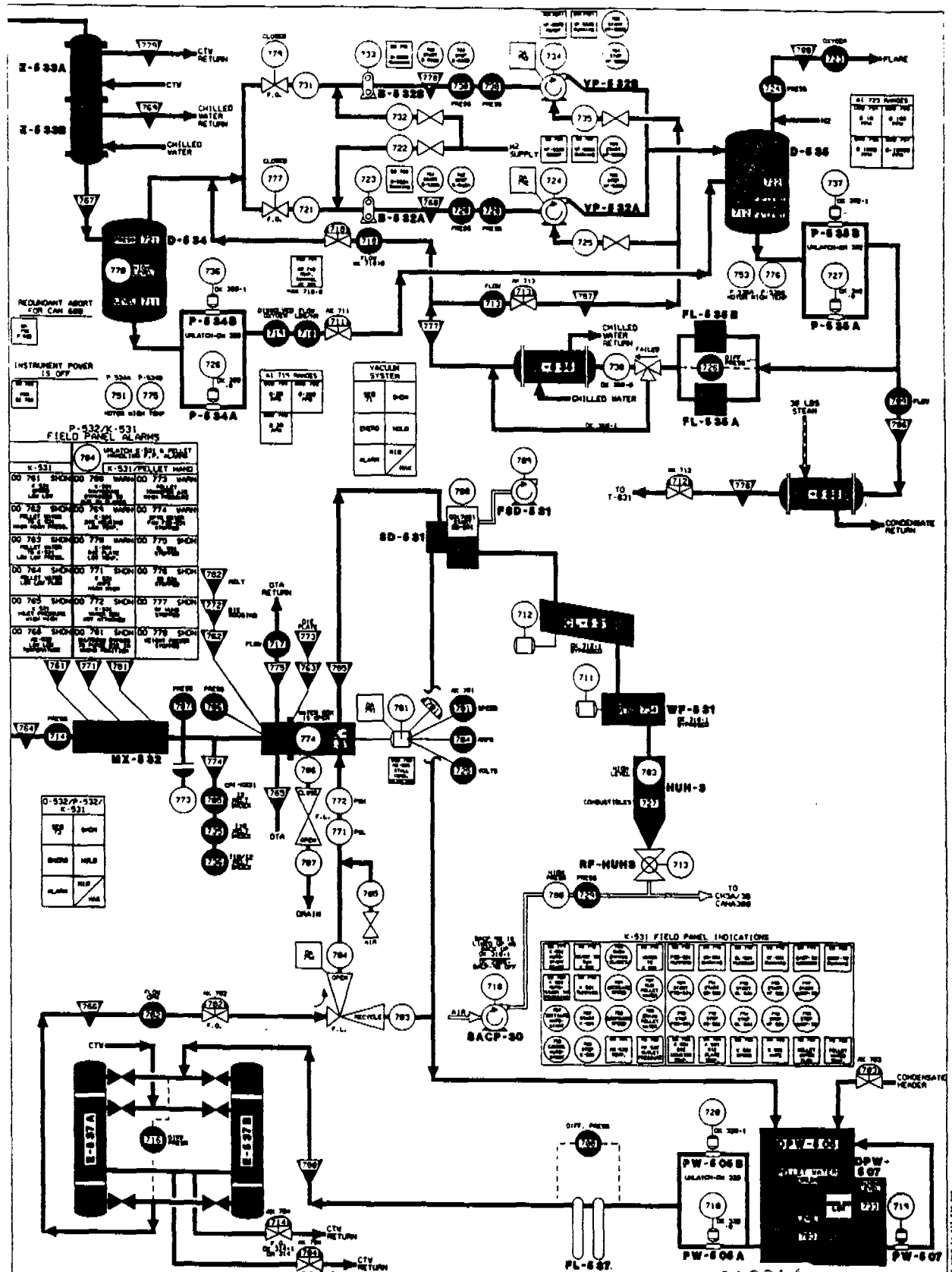
REDUNDANT SHOTS FOR CASE 788

1st	2nd	3rd	4th
582	583	584	585

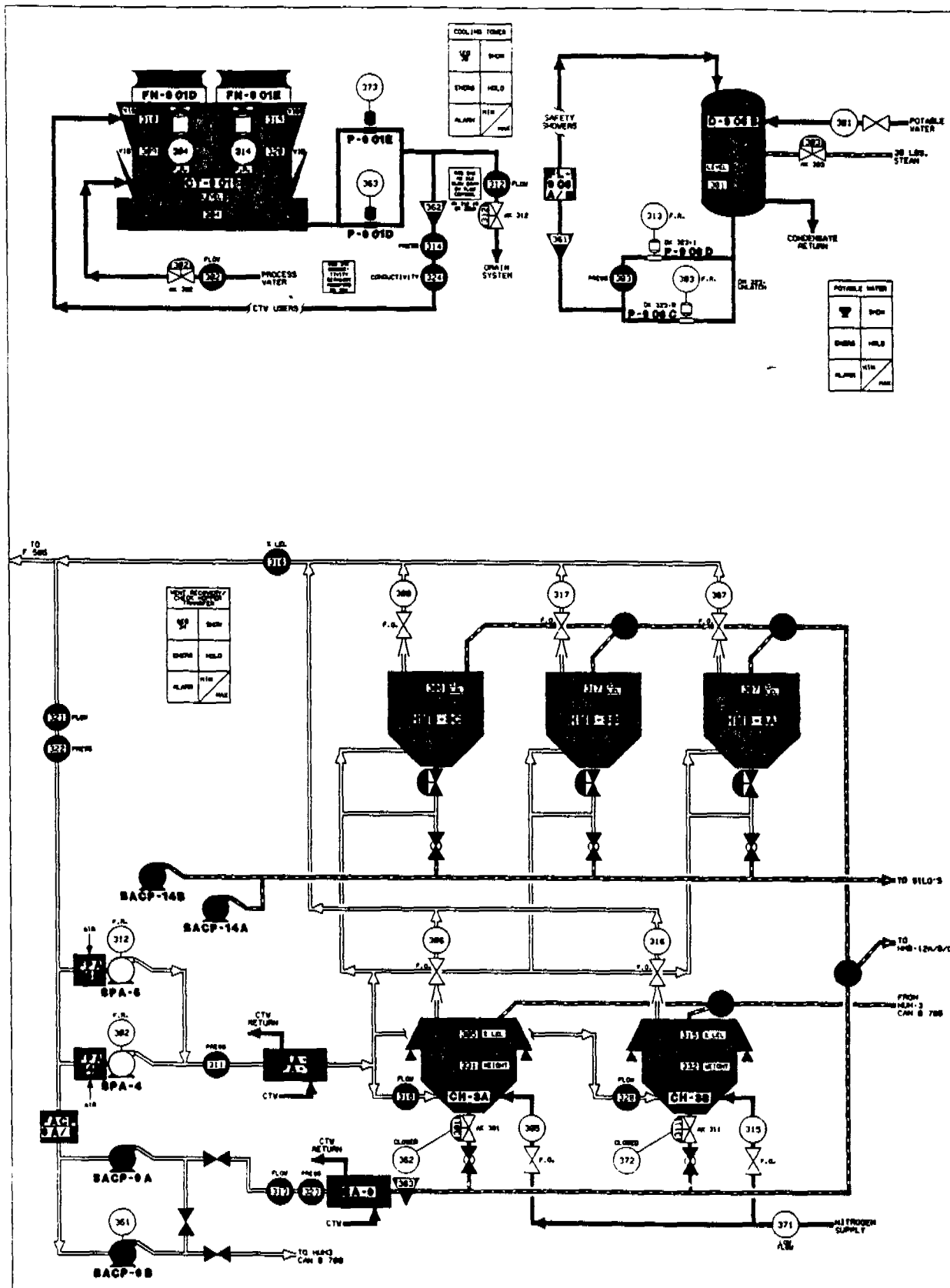


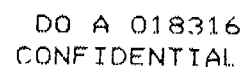
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UPDATES 2/13/94
NO-028 P.28 002

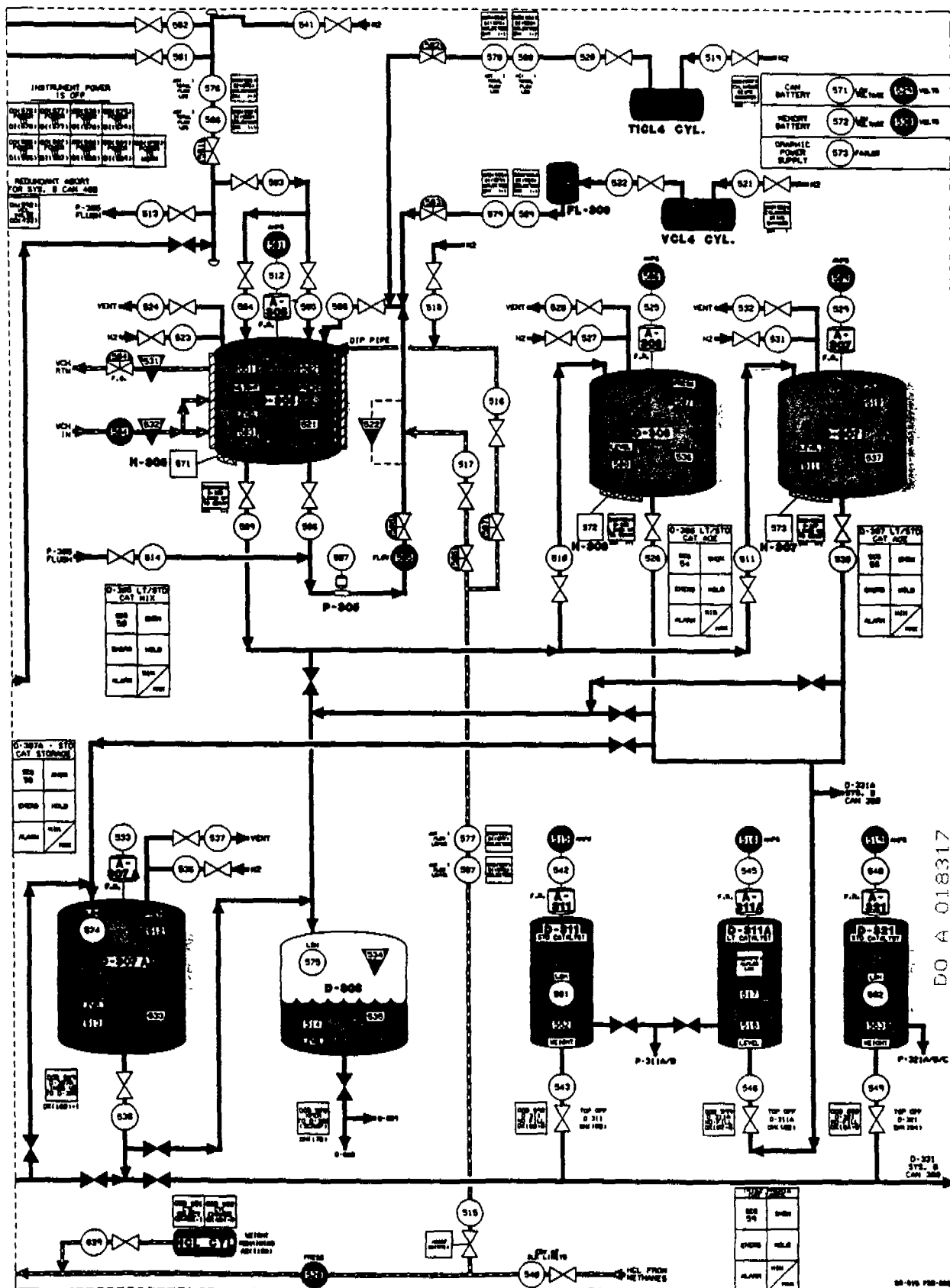


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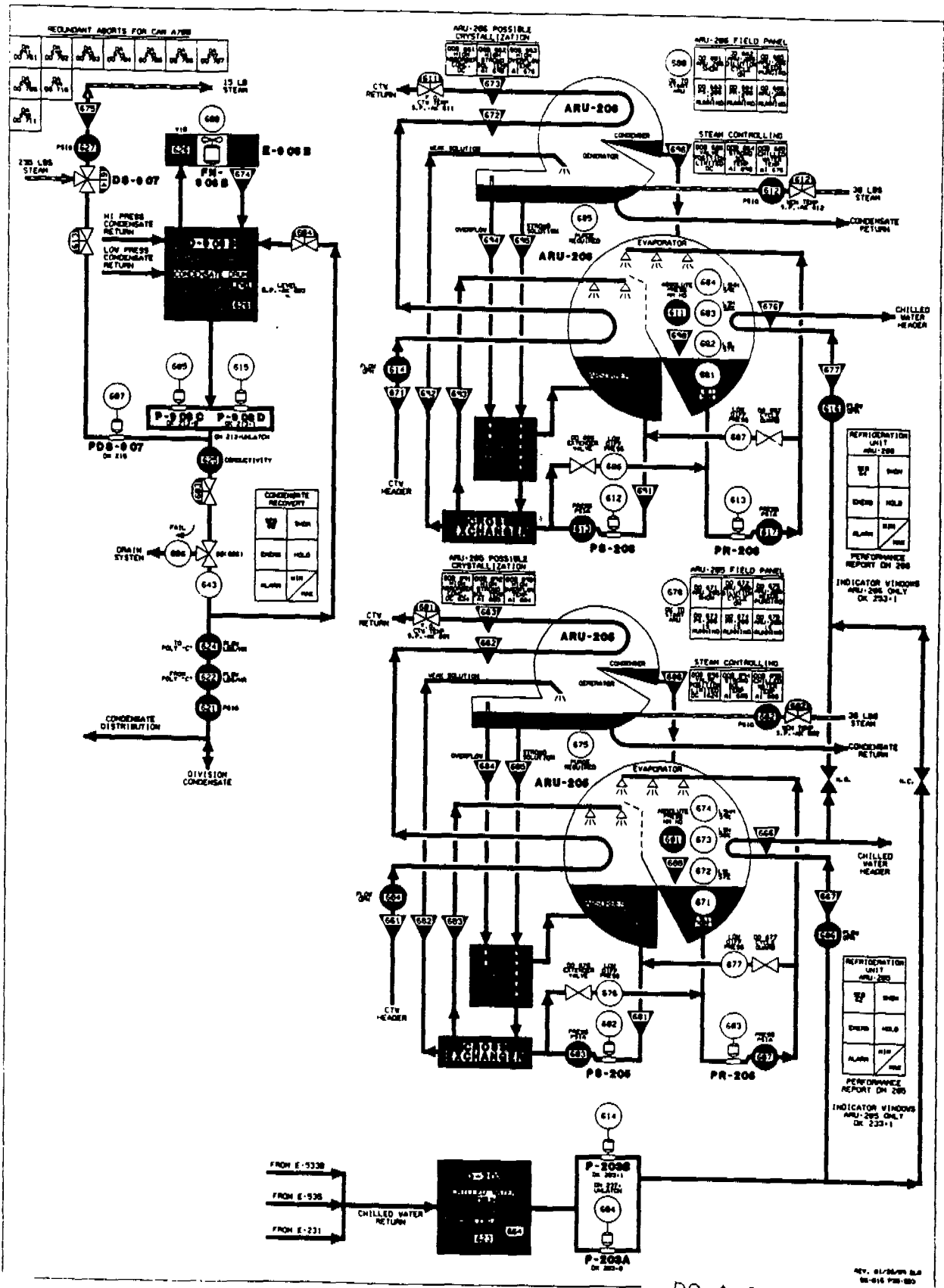




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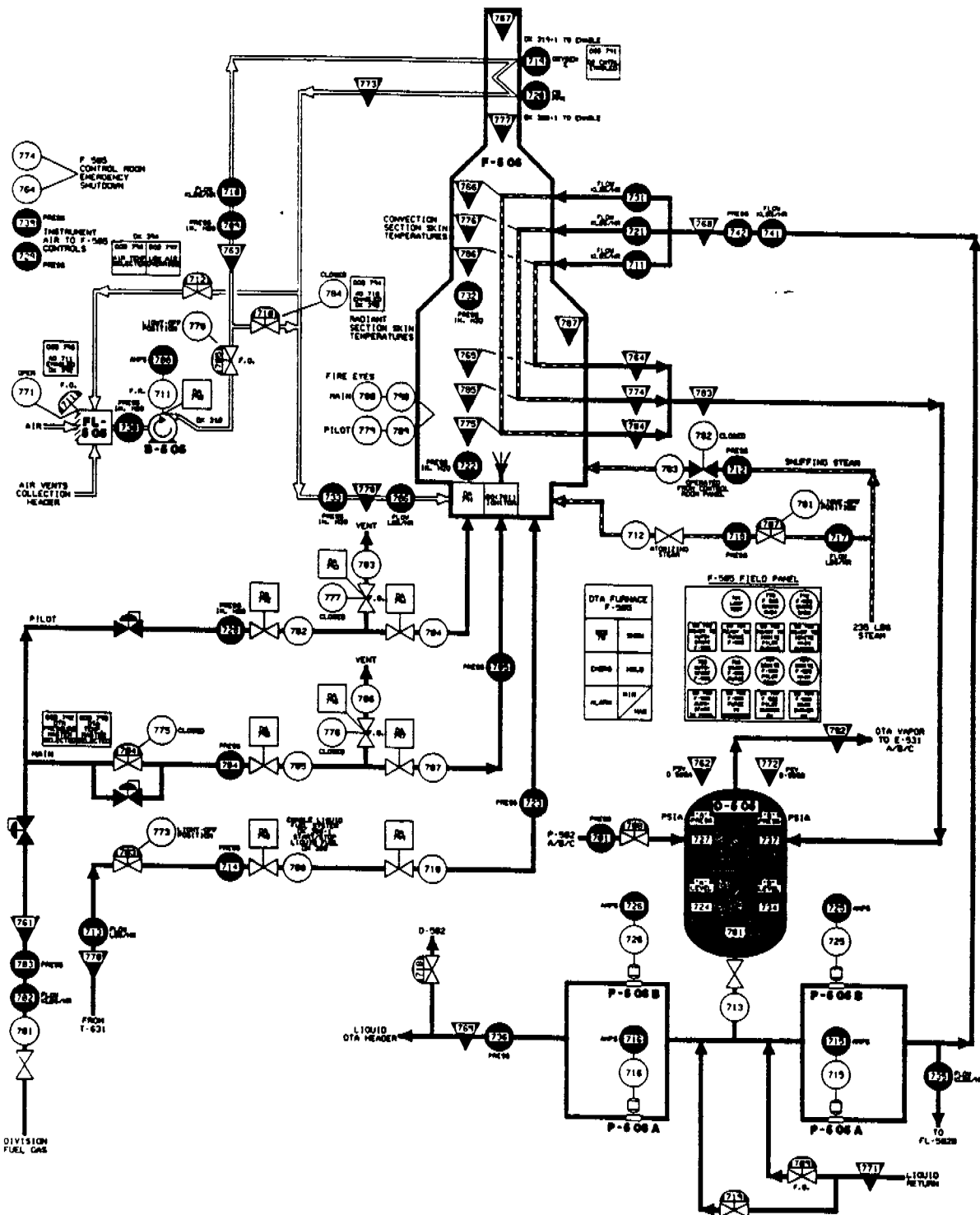
DO A 018317
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DO A 018318
CONFIDENTIAL

INSTRUMENT POWER IS OFF

32 228
1-10-61



DO A 018319
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UPON 100 10/15/61
10-117 228-002

CHECK HOPPER AND BLENDER VENT RECOVERY

PURPOSE

TO REDUCE HYDROCARBON EMISSIONS

SAFEGUARDS

%LEL ALARMS IN EACH VESSEL AND THE COLLECTION HEADER

%LEL ALARMS ARE ACTIVE IN ALL STEPS

%FL-505 AND FPA-4,5 CAN TAKE FRESH AIR

MOD-V CONTROLLED

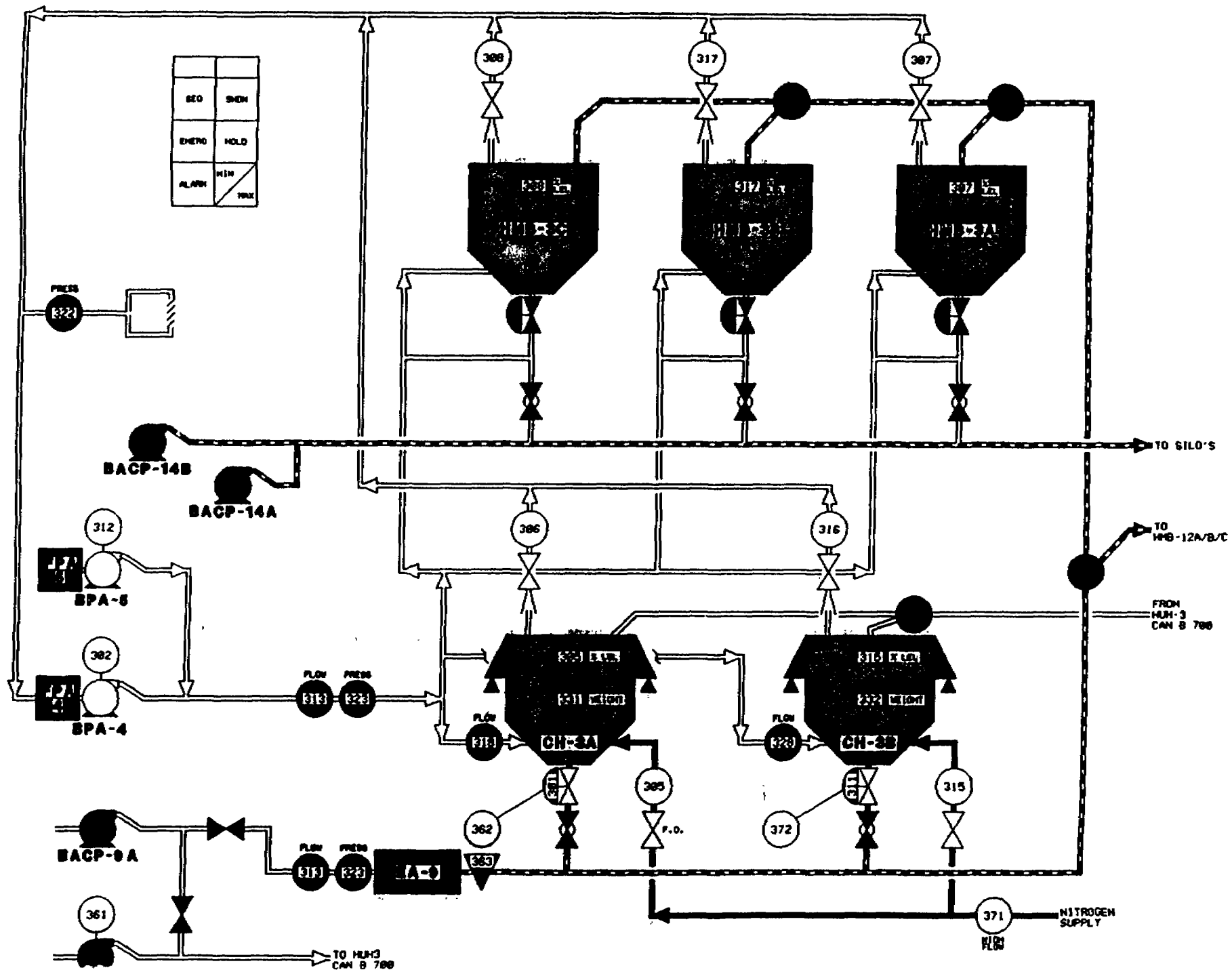
EACH VESSEL CAN BE ISOLATED

VENT COLLECTION HEADER IS OPEN TO ATMOSPHERE

DNB 5/80

DO A 018320
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SEO	SHOW
ENTERO	HOLD
ALARM	MIN
	MAX



DO A 018321
CONFIDENTIAL

10-10-68
10-10-68

BURNING WAXES IN F-505

ENVIRONMENTAL CONCERNS

REACTIVITY BETWEEN T-631 AND F-505 COMPONENTS

BURNER SAFETY

OPERATOR INTERVENTION

REACTIVITY OF COMPONENTS

COMBUSTION

2% EXCESS AIR BASED ON 15 LB AIR/ LB FUEL
ALL MAJOR COMPONENTS FORM CO₂ AND H₂O

CORROSION

TRACE CHLORIDES SHOULD NOT BE A PROBLEM?
STACK TEMP. CONTROL WILL MINIMIZE CONDENSATION

REACTIVITY

NO REACTIVITY BETWEEN FUEL GAS AND LIQUID FUEL
ONLY COMBUSTION PRODUCTS WILL CONTACT ONE ANOTHER

DRB 5/89

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BURNER SAFETY

BURN LIQUID FUEL ONLY IN THE "RUN" STEP
FUEL FLOW IS CONTROLLED AND MONITORED BY MOD-V
ATOMIZING STEAM IS CONTROLLED AND MONITORED BY MOD V
SIMULATION RUNS PERFORMED BY OPERATORS, ENGINEERS

OPERATOR RESPONSIBILITY

PURGE THE LIQUID FUEL GUN
MANUALLY UNBLOCK THE FUEL AND ATOMIZING STEAM
RAISE OR LOWER THE LIQUID FUEL GUN
VISUALLY INSPECT THE FURNACE DAILY

000 4/70

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