

PROJECT FILE COPY

File No. \_\_\_\_\_

UNION CARBIDE CORPORATION  
CHEMICALS AND PLASTICS  
ENGINEERING DEPARTMENT

DESIGN REPORT

"POLYOX" PLANT NO. 2  
INSTITUTE, WEST VIRGINIA  
PART I - CATALYST SYSTEM

OCTOBER 4, 1968

SOUTH CHARLESTON  
WEST VIRGINIA

PLAINTIFF'S  
EXHIBIT

76032.00

UCASB00225047

(DWT-100-A - Agitator - Continued)

Agitator Continued

|                                                                                  |                                                     |
|----------------------------------------------------------------------------------|-----------------------------------------------------|
| Direction of rotation looking from motor end:                                    | Clockwise                                           |
| Gear reducer AGMA rating:                                                        | Class I (acceptable)                                |
| Gear lubrication:                                                                | Oil                                                 |
| Bearing minimum B <sub>10</sub> life (output shaft and agitator shaft bearings): | 2,000 hrs                                           |
| Agitator mounting:                                                               | 5 in. 150 lb ASA pad on vessel                      |
| Agitator shaft:                                                                  |                                                     |
| Shaft type:                                                                      | Solid                                               |
| Diameter:                                                                        | 1 in. OD                                            |
| Length:                                                                          | 67 in. approx from face of agitator mounting flange |
| Acceptable ratio % operating first critical speed:                               | Not between 70% and 135%                            |
| Internal foot or steady bearing:                                                 | Not acceptable                                      |
| Baffles:                                                                         | Not acceptable                                      |
| Heating-cooling provisions:                                                      | Not required                                        |

Materials of Construction

|                      |                                          |
|----------------------|------------------------------------------|
| Shaft:               | Steel                                    |
| Impellers:           | Steel                                    |
| Gaskets:             | Hard asbestos                            |
| Other wetted parts:  | Steel                                    |
| Mount flange face:   | Steel                                    |
| Shaft sealing, type: | Packing; not to be considered as bearing |

Shaft Sealing

|                           |                                           |
|---------------------------|-------------------------------------------|
| Type:                     | Stuffing box                              |
| Pressure rating:          | 150 psig                                  |
| Lantern ring:             | Required                                  |
| No. rings above lantern:  | By Manufacturer                           |
| No. rings below lantern:  | By Manufacturer                           |
| Separators:               | By Manufacturer                           |
| Throttle bushing:         | Not required                              |
| Materials,                |                                           |
| Stuffing box core:        | 304 stainless steel                       |
| Lantern ring:             | 304 stainless steel                       |
| Kind of packing:          | Pure braided Teflon with Teflon suspended |
| Separators:               | Teflon (if used)                          |
| Fittings, nuts and bolts: | Stainless steel acceptable                |
| Gland:                    | Stainless steel acceptable                |

|                                               |              |
|-----------------------------------------------|--------------|
| Tank shutoff for seal or packing maintenance: | Not required |
|-----------------------------------------------|--------------|

Impellers

|                                                             |                |               |
|-------------------------------------------------------------|----------------|---------------|
| Number and diameter:                                        | (1) 8.9 in.    | (2) 8.9 in.   |
| Type:                                                       | Propeller      | Propeller     |
| Number of blades:                                           | 3              | 3             |
| Pitch:                                                      | 1 x 1-1/2      | 1 x 1-1/2     |
| Dist. from Mtg. face to L:                                  | 65 in. approx  | 28 in. approx |
| Stabilizer type (By Mfr)                                    | Yes            | Hubbs: solid  |
| Invested horsepower: (Mfr. est.):                           | 0.20           |               |
| Total installed weight of agitation equipment, motor incl.: | 125 lb approx. |               |

(PXX2-100-A - Agitator - Continued)

Materials of Construction

|                     |                                                                    |
|---------------------|--------------------------------------------------------------------|
| Shaft:              | Steel                                                              |
| Impellers:          | Cast iron                                                          |
| Gaskets:            | Hard asbestos, white - Johns-Manville<br>No. 60 or No. 61 or equal |
| Other wetted parts: | Steel                                                              |
| Mount flange face:  | Steel                                                              |
| Spool piece:        | Steel                                                              |

Shaft Sealing

|                          |                       |
|--------------------------|-----------------------|
| Type:                    | Stuffing box          |
| Pressure rating:         | 300 psig*             |
| Lantern ring:            | Required              |
| No. rings above lantern: | By manufacturer       |
| No. rings below lantern: | By manufacturer       |
| Separators:              | By manufacturer       |
| Throttle bushing:        | No                    |
| Materials,               |                       |
| Stuffing box core:       | 316 SS                |
| Lantern ring:            | 316 SS                |
| Kind of packing:         | Teflon (pure braided) |
| Make and No.:            | Gerlock No. 5888      |
| Fittings (nuts & bolts): | 316 SS                |
| Gland:                   | 316 SS                |

\*Operating pressure 70 psig - 300 psig operational upset pressure.

|                                                    |    |
|----------------------------------------------------|----|
| Jacketed stuffing box:                             | No |
| Water cooled gland:                                | No |
| Tank shutoff for seal or<br>packing maintenance:   | No |
| Other requirements pertaining<br>to shaft sealing: |    |

Note that operating pressure is 70 psig.  
Whereas, packing must be rated for 300 psig.  
Rupture disk will be set at slightly less  
than 300 psig. Parts must pass 17 in.  
diameter opening.

Impellers

|                            |                        |               |
|----------------------------|------------------------|---------------|
| Number and diameter        | (1) 11 in.             | (2) 11 in.    |
| Type:                      | Propeller              | Propeller     |
| Number of blades:          | Three                  | Three         |
| Pitch:                     | 1 x 1                  | 1 x 1         |
| Dist. from Mtg. face to C: | 66 in. approx          | 51 in. approx |
| Hub:                       | Solid                  |               |
| Stabilizer:                | None                   |               |
| Invested horsepower:       | 0.48 (by manufacturer) |               |

Total installed weight of agitation equipment, motor including 250 lb plus  
spool piece lbs (by Mfr)

(FOK-110-A - Agitator - Continued)

Agitator

|                                                                                  |                                                              |
|----------------------------------------------------------------------------------|--------------------------------------------------------------|
| Make and Model:                                                                  | Cleveland Model AL2M-4                                       |
| Clearance:                                                                       | 10 in. approximately                                         |
| Speed reduction:                                                                 | Worm gear                                                    |
| Output speed:                                                                    | Constant                                                     |
| Operating output (agitator):                                                     | 8 1/2 rpm                                                    |
| Direction of rotation looking from motor end:                                    | Clockwise                                                    |
| Gear reducer AGMA rating:                                                        | Class II, lubrication-oil                                    |
| Bearing minimum B <sub>10</sub> life (Output shaft and agitator shaft bearings): | 17,500 hours                                                 |
| Agitator mounting:                                                               | Pad flange 300# ASA 10 in., on vessel                        |
| Agitator shaft:                                                                  |                                                              |
| In tank shaft coupling:                                                          | Acceptable                                                   |
| Shaft type:                                                                      | Solid                                                        |
| OD 2-1/2 in., length from agitator mount face approximately 126 in.              |                                                              |
| Calculated critical speed:                                                       | 146 rpm (By Manufacturer)                                    |
| Maximum acceptable ratio % operating to first critical rpm:                      | 65.0%                                                        |
| Internal foot or steady bearing:                                                 | Not acceptable                                               |
| Baffles:                                                                         |                                                              |
| Type:                                                                            | Flat                                                         |
| Dimensions :                                                                     | No. 4, width 5 in., length 114 in., dist. off wall 1-1/2 in. |
| Heating provisions:                                                              | Provided by Buyer                                            |
| Type:                                                                            | External jacket                                              |

Materials of Construction

|                     |               |
|---------------------|---------------|
| Shaft:              | Steel         |
| Impellers:          | Steel         |
| Gaskets:            | Hard asbestos |
| Other wetted parts: | Steel         |
| Mount flange face:  | Steel         |

Shaft Sealing:

|                                       |                                                                                                       |
|---------------------------------------|-------------------------------------------------------------------------------------------------------|
| Type                                  | Mechanical; double inside, balanced                                                                   |
| Rating adequate for:                  | 60 psig norm, 300 psig during operational upset 40°C temp. norm, 100°C temp. during operational upset |
| Mating faces:                         | Carbon and Stellite                                                                                   |
| Metal parts,                          |                                                                                                       |
| Exp. to process:                      | 316 SS, 304 acceptable                                                                                |
| Exp. to lub:                          | 316 SS, 304 acceptable                                                                                |
| Shaft packing and other static seals: | Teflon                                                                                                |
| Seal flushing:                        | Not required                                                                                          |
| Sealing lube:                         | UCON LB170X                                                                                           |
| Type of system:                       | Circulating                                                                                           |

POX2-113 - CATALYST SLURRY PUMP

To transfer catalyst slurry from Stripper Tank, POX2-110, to Storage Tanks, POX2-114, 115, 116, and 117.

| UCCC Specifications          |        |              | Mfr's. Specifications               |                              |
|------------------------------|--------|--------------|-------------------------------------|------------------------------|
| Case A                       | Case B |              | Case A                              | Case B                       |
| 30                           |        | Performance  | Volume to be pumped, gpm            | 30                           |
| 120                          |        |              | Head, ft (See Note 2, 935-48)       | 120 + 1 = 121                |
| 2                            |        |              | NPSH available, ft                  | X                            |
| 315                          |        |              | Suction pressure, max., psia        | X                            |
| Organic                      |        |              | Material handled                    | X                            |
| Liquid                       |        |              |                                     |                              |
| 0.85                         |        |              | Sp. Gr. max. (ref 20 °C water)      | X                            |
| 0.30 cp                      |        |              | Viscosity, normal, cp               | X                            |
|                              |        |              | maximum, cp                         |                              |
| 35 (95)                      |        |              | Temperature, normal, °C (°F)        | X                            |
| 85 (185)                     |        |              | maximum, °C (°F)                    | X                            |
| 28 (82.4)                    |        |              | Atmospheric boiling point °C (°F)   | X                            |
| Present, 12%                 |        |              | Suspended solids, % by weight       | X                            |
| Not Abrasive, 50-100 microns |        |              | Character/Largest particle, in.     | X                            |
| 3000 Hours per year          |        |              | Type of service                     | X                            |
| To be stated by mfr          |        | Construction | Speed, rpm                          | 1750                         |
| Centrifugal                  |        |              | Class                               | X Refinery Type              |
| Horizontal or Vertical       |        |              | Type, shaft position                | Horizontal                   |
| Closed or Open               |        |              | Impeller type                       | Closed                       |
| Single/End preferred         |        |              | Impeller suction/Suction position   | SE                           |
| Not Required                 |        |              | Self-priming feature                |                              |
| Radially split preferred     |        |              | Casing type                         | R.S.                         |
| Not Required                 |        |              | Casing vent connection              |                              |
| Not Required                 |        |              | Casing drain connection             |                              |
| Solid or Sleeved             |        |              | Shaft type                          | Sleeved, circumscribed       |
| Ball preferred               |        |              | Bearing type                        | Ball                         |
| Oil preferred                |        |              | Bearing lubrication                 | Oil                          |
| Not Required                 |        |              | Water-cooled bearings               |                              |
| Mechanical                   |        |              | Shaft seal                          | X                            |
| Not Required                 |        |              | Jacketed stuffing box               |                              |
| Not Required                 |        | Materials    | Smothering type gland               |                              |
| Not Required                 |        |              | Throat bushing, rad. clearance, in. |                              |
| Not Required                 |        |              | Teflon lip seal throat bushing      | X                            |
| Required                     |        |              | Casing                              | Cast Steel                   |
| Cast Steel see note 1        |        |              |                                     |                              |
|                              |        |              | Impeller                            | Duct. Ni-Resist              |
| Cast Iron                    |        |              | Shaft (solid type)                  |                              |
| 316SS                        |        |              | Shaft (with sleeve)                 | 400SS                        |
| 400 Series steel             |        |              | Shaft sleeve                        | 316SS                        |
| 316SS                        |        |              | Interstage sleeve (if any)          | None                         |
| To be stated by mfr          |        |              | Interstage bushing (if any)         | None                         |
| To be stated by mfr          |        |              | Casing ring (if any)                | Duct. Ni-Resist              |
| To be stated by mfr          |        |              | Impeller ring (if any)              | None                         |
| To be stated by mfr          |        |              | Impeller nut (if any)               | AL5303                       |
| To be stated by mfr          |        |              | Casing gasket                       | Metal Asbestos               |
| 316SS                        |        |              | Gland                               | X                            |
| 18-8 CrNi Steel or equal     |        |              | Gland bolts and nuts                | X                            |
| Electric Motor               |        | Driver       | Type                                | Sq. Cage Ind.                |
| To be stated by mfr          |        |              | Make                                | AC, GE, LA, US, WESTING. REL |
| 3 ph, 60 cy, 440 v.          |        |              | Current characteristic              | 3 ph, 60 cy, 230/460 ..      |
| Explosion-proof              |        |              | Enclosure (See 93838-272A)          | Explosion-proof              |
| Class 1, Group D, Div. 1     |        |              |                                     | X                            |

UCASB00225110

(Items POX2-114-A, -115-A, -116-A, and -117-A - Agitators - Continued)

Physical properties at end of  
mixing operation:

Estimated specific gravity: 0.85  
Viscosity: 0.3  
% solids: Approx 12-13%

Operation: Multi-volume - variable liquid level batch  
Duty: 24 hours per day  
Agitator to operate during  
charging and discharging: Yes

Driver Type

Type: Electric motor, explosion-proof,  
"B" Insulation  
Current: 3-phase, 60 cycle, 440 volt  
Speed: 1750 rpm  
Horsepower: 5.0  
Frame No.: 184TC or 215C  
Motor to be furnished and  
installed by: Manufacturer

Motor coupling to be furnished with agitator and, if flexible, Falk Steelflex.

Agitator

Make and model: Chemineer Model CNJ-50-520  
Clearance: 11 in. approx.  
Speed reduction: Gear  
Output speed: Constant  
Operating output (agitator): 87 rpm  
Direction of rotation looking from  
motor end: Clockwise  
Gear reducer AGMA rating: Class II, lubrication - oil  
Bearing minimum B10 life (output  
shaft and agitator shaft  
bearing: 17,500 hrs  
Agitator mounting: Pad flange 150 lb, 8 in. ASA on vessel  
Agitator shaft,  
In tank shaft coupling: Included  
Shaft type: Solid  
OD 2.5 in. length from agitator mount face 128.5 approx.  
Calculated critical RPM 141 (by manufacturer)  
Max acceptable ration % operating to first critical RPM 65.0%  
Internal foot or steady bearing: No  
Baffles,  
Type: Flat  
Dimensions: No. 4, width 5 in., length 124 in.,  
distance off wall 1-1/2 in.  
Heating-cooling provisions: Not required

Materials of Construction

Shaft: Steel  
Impellers: Steel  
Gaskets: Hard asbestos (White - Johns-Manville  
No. 60 or No. 61 or equal