

CONFIDENTIAL

COBALT CRYSTALLIZER

EXECUTIVE SUMMARY

The crystallizer circuit was designed and constructed by Whiting Equipment Canada Inc. and includes one crystallizer body and heat exchanger.

The circuit was originally intended to operate as a forced-circulation, surface-cooled crystallizer to produce a pure cobalt-ammonium sulphate double salt.

The design conditions of the crystallizer is to cool the incoming process solution from 185°F to 75°F at atmospheric pressure and it is constructed from SA182-316L stainless steel.

The crystallizer body measures 8 feet tall and 9 feet in diameter, with a 60° conical bottom and a closed top with a flat cover. The vessel is designed to operate full of saturated solution with a liquid volume of 680 ft³. The crystallizer is built to ASME Sec. VIII, Div. 1 2007 Edition.

The heat exchanger shell measures 32 inches in diameter and 32 feet long, equipped with 199 1.5 inch O.D. tubes (0.049 inch wall thickness), resulting in 2340 ft² of heat transfer area. The heat exchanger shell is constructed out of carbon steel and tubes are constructed out of SA240-316L stainless steel, with carbon steel baffles. The heat exchanger is built to ASME Sec. VIII, Div. 1 2007 Edition.

CONFIDENTIAL

PARTS LIST

Major equipment in this package includes:

- Crystallizer body;
- heat exchanger;
- Detailed list of miscellaneous parts available upon request.

Components not included in the package:

- Recirculation pump;
- Large diameter pipe;
- Instrumentation;
- External connecting piping;
- Electrical cabling;
- Valves and fittings;
- Vent seal pot; and
- Crystallizer slurry discharge pumps.

EQUIPMENT PHOTOGRAPHS



Figure 1. Photograph of the assembled crystallizer body



Figure 2. Photograph of the assembled crystallizer body (top view)

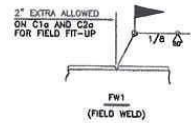
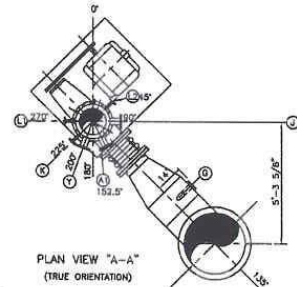
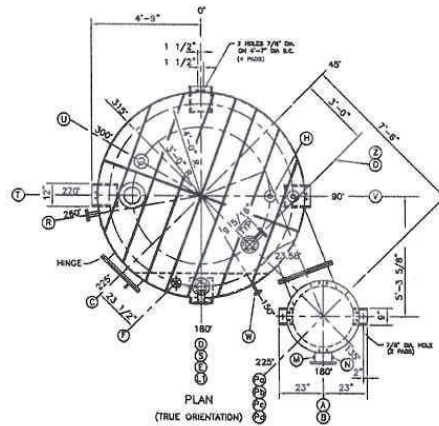
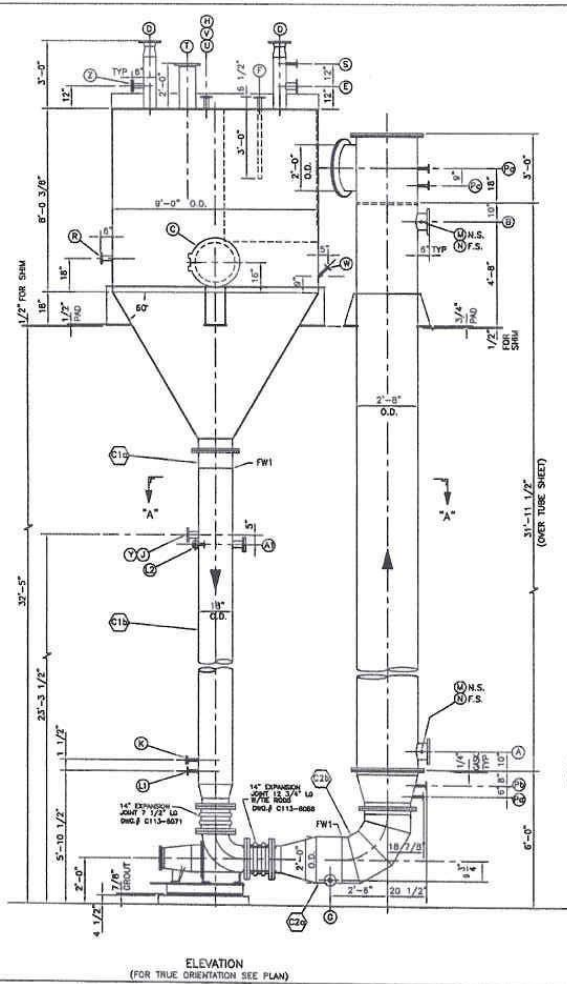


Figure 3. Photograph of shell and tube heat exchanger.



Figure 4. Photograph of the large diameter pipe connection the crystallizer body to the recirculation pump.

ESK-12327



APPROXIMATE WEIGHTS (LBS)		
EMPTY	8000	12000
NORMAL OPERATION	87000	28000
MAX. OPERATION	73000	27000

QTY	SIZE	DESCRIPTION	MAT'L	MARK
1	8"	WATER INLET	STN. STL.	A
1	8"	WATER OUTLET	STN. STL.	B
1	24"	MANHOLE	MAN-316	C
2	4"	BODY VENTS	SA240-316L	D
1	3"	MOTHER LIQUOR DISCHARGE	SA240-316L	E
1	1 1/2"	MOTHER LIQUOR RETURN	SA240-316L	F
1	3"	C/W BLIND	SA240-316L	G
1	3"	DRAIN	SA240-316L	H
1	3"	FEED	SA240-316L	I
1	3"	SLURRY DISCHARGE	SA240-316L	J
1	1"	SAMPLE COHN. C/W BLIND	SA240-316L	K
2	1"	SAMPLE COHN.	SA240-316L	L1, L2
2	1 1/2"	PRESS. COHN. C/W PLUG	SA240-316L	M
2	3/4"	TEMP. COHN. C/W PLUG	SA240-316L	N
4	1"	TEMP. COHN.	SA240-316L	PO-P3
1	3"	FLY-O SPARE COHN. W/BLIND	SA240-316L	R
1	1"	LEVEL SWITCH HIGH	SA240-316L	S
1	6"	LEVEL INDIC. TRANS.	SA240-316L	T
1	3"	SPARE	SA240-316L	U
1	2"	BARRON LIQUOR	SA240-316L	V
1	1"	LEVEL INDICATOR	SA240-316L	W
1	3"	SLURRY DISCHARGE	SA240-316L	X
1	2"	SPARE COHN. C/W BLIND	SA240-316L	Y
1	3"	SPARE COHN. C/W BLIND	SA240-316L	Z

CRYSTALLIZER BODY: 9'-0" O.D.
SHELL: 1/4" THK. SA240-316L STN. STL.

HEATING ELEMENT: 2'-8" O.D.
SHELL SDC: A7-54-8 2'-8" O.D. .375 WALL PIPE
TUBE SIDE: 1/4" THK. SA240-316L (STN. STL.)
TUBE SHEETS: SA240-316L (STN. STL.)
TUBES: 189 - 1 1/2" O.D. x 18 BWD 32'-0" LG.
318 STD. STA. SA 240
MAX. ALLOW. WORKING PRESSURE: 50 PSIG @ 200°F SHELLSIDE
MIN. DESIGN METAL TEMP.: -32°F @ 50 PSIG SHELLSIDE
CORROSION ALLOWANCE: 1/16" SHELLSIDE

PIPING:
24" O.D. SCH. 5S - SA240-316L (STN. STL.)
18" O.D. SCH. 5S - SA240-316L (STN. STL.)
GENERAL NOTES:
- THE HEATING ELEMENT SHELL SIDE ONLY WILL BE DESIGNED AND FABRICATED FOR 50 PSIG WORKING PRESSURE AND TESTED TO 75 PSIG.
- ALL WELDS TO BE CONTINUOUS UNLESS OTHERWISE NOTED AND MUST BE DONE BY QUALIFIED WELDERS USING PROPER FILLER METALS AND PROCEDURES.
- FACE OF FLANGES TO BE FAT AND SQUARE WITH CENTER LINE. BOLT HOLES TO STRADDLE HED. E UNLESS OTHERWISE NOTED.
- ALL FLANGES FOR CUSTOMER CONNECTIONS TO BE 100% DRILLING

TOLERANCES UNLESS OTHERWISE NOTED		UNLESS OTHERWISE SPECIFIED	
FINISH	SEE L. LIST FOR SPECIAL REQUIREMENTS, UNLESS OTHERWISE NOTED	ANGLES	SEE L. LIST FOR SPECIAL REQUIREMENTS, UNLESS OTHERWISE NOTED
DIAMETERS	UNDER 1/8" 1/8" OVER 1/8"	ANGLES	SEE L. LIST FOR SPECIAL REQUIREMENTS, UNLESS OTHERWISE NOTED
DECIMALS	1.000" 1.000" 1.000"	ANGLES	SEE L. LIST FOR SPECIAL REQUIREMENTS, UNLESS OTHERWISE NOTED
FRACTIONS	1/8" 1/8" 1/8"	ANGLES	SEE L. LIST FOR SPECIAL REQUIREMENTS, UNLESS OTHERWISE NOTED
SHIMMERS HOLD DECIMALS APPLY REWARD PRACTICE			
MACHINE BEARS AND SHIMS SHOWN UNLESS OTHERWISE NOTED			
THE DRAWING IS THE PROPERTY OF WHITING EQUIPMENT CANADA INC. IT IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED THEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF WHITING EQUIPMENT CANADA INC.			
WHITING EQUIPMENT CANADA INC.			
WELLAND-ONTARIO			
SIC	TITLE	C/W	9'-0" O.D.
OR	DATE	OR	SURFACE COOLED CRYSTALLIZER
APP.	SCALE	APP.	1/2" = 1 FT.
APP.	APP.	APP.	SHERRITT INTERNATIONAL
APP.	APP.	APP.	C/O HATCH LTD.
ESK-12327			