QENOS ELASTOMERS MANUFACTURING

POLYBUTADIENE PLANT PROCESS DESCRIPTION TO BE READ WITH REFERENCE TO DRAWING BR-909-1002 and BR-909-1003

TECHNOLOGY: Goodrich Gulf Ziegler Natta solution polymerisation

Fresh butadiene (99% purity) is charged to the caustic and water decanters D-354/D-355 where polymerisation inhibitor is removed. The washed butadiene passes to the surge drum D-356A from which it is pumped to the feedstock blending station. Recycle solvent is charged from D369A/B together with recycle C6 from D-453 and fresh butene-1 with the butadiene through the blending station to the wet feedstock decanter D-356B and on to the blended feed drum D-359. The wet feedstock is then pumped to the distillation drying column feed decanter D-950, through the column feed preheater E-951 to the drying column T-950 where it enters on the top tray. Water is stripped from the solvent as it passes down the column passing overhead in a C4 rich stream which is condensed and mixed with the decanter feed to separate water. Boil up in the column is provided by E-952 which uses low pressure steam.

Dry feedstock is returned to D-351 through the bottoms cooler E-953 prior to being charged to the polymerisation reactors R351/352/353. A small amount of water as catalyst is added to the suction of the charge pumps P355 from which the feedstock passes through a feed chillier E-351 which is cooled against vaporizing ammonia. Catalyst D-1 prepared in the dilution drums D-650A/B is charged to the feedstock prior to the catalyst ageing drum D-358 on the way to the reactors. The third catalyst component C-1 is added to the polymerisation reactor from make up drum D-350A/B. This initiates the reaction. 2 reactors are operated in parallel at any one time with the third being washed with solvent to remove gel.

The reaction mixture called cement is a high viscosity polymer solution and is pumped using variable speed positive displacement pumps. Reactor temperature is controlled at 22 degrees Celsius by overhead reflux condensers and the reaction reaches about 60% conversion. Antioxidant used as a shortstop can be added between the pump suction and the reactor to stop the reaction. The cement passes to surge drums D-551A/B then through a blending station to the blended cement drum D552.

Blended cement is then pumped to the water addition drum D-450 where it is contacted with complexing water to remove residual catalyst before passing to the coagulator CS-450. At the coagulator the cement is contacted with hot motive water and steam and the solvent is evaporated leaving slurry of hot water and rubber crumb. The crumb slurry passes from the coagulator through two stripping vessels CS-451A/B for recovery of residual solvent and then along a pipe to a surge tank TK556 in the finishing area.

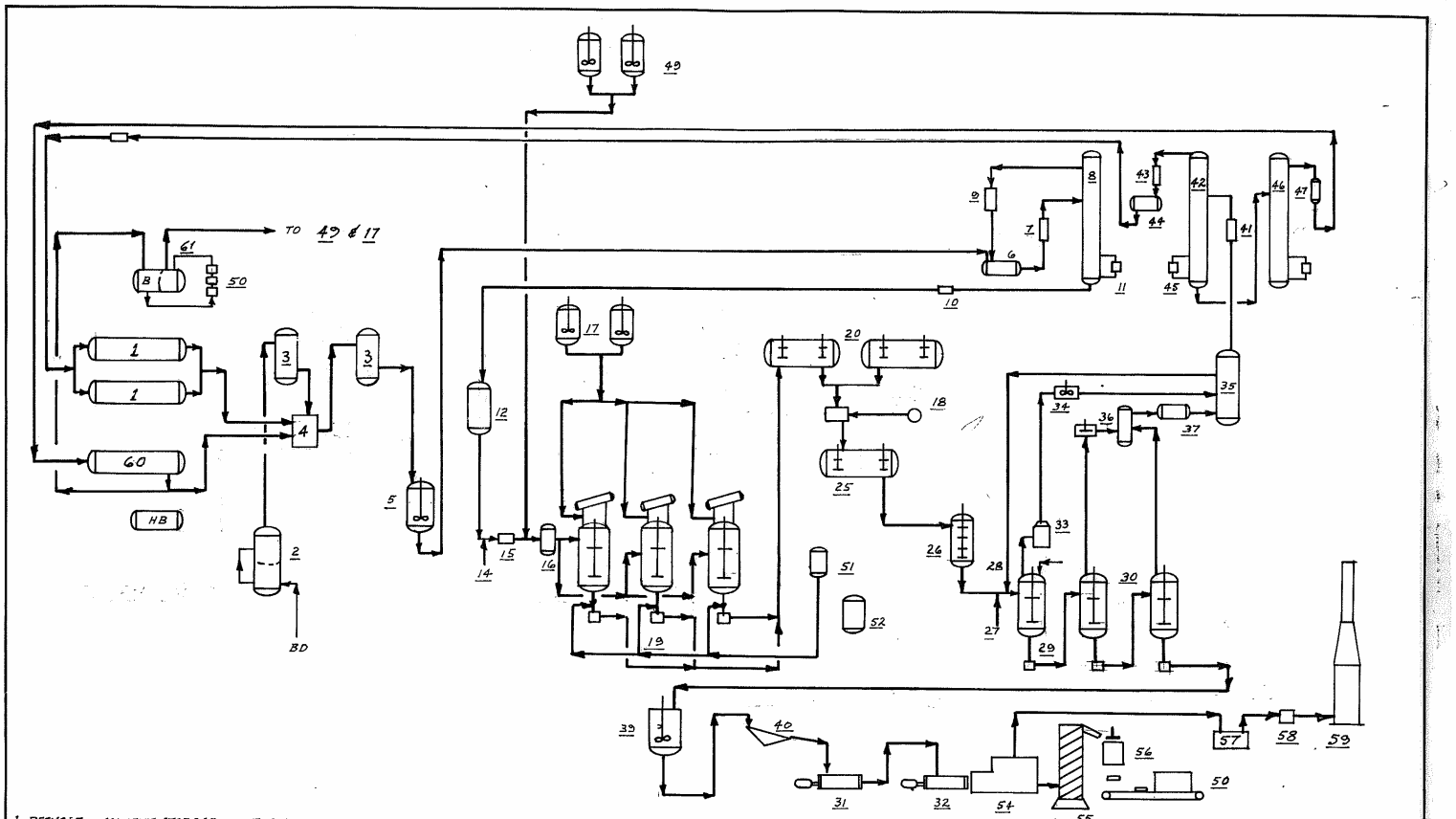
Overhead solvent and steam from the coagulator passes through a knock out drum to a condenser E-459/E-465 and an accumulator D-459. This accumulator called the recovery surge decanter separates water from recovered solvent. The water is recycled to the coagulator while the solvent is pumped through a preheater to the C4 distillation column T-452. The bottom product from this column is a C6 stream which passes to a second distillation column T-453 for purification. This tower produces a pure C6 overhead which passes to a condenser and is pumped to D-453 via P-460. The overhead from the C4 column passes through a condenser to D-460 from which it is returned to D-369A/B. Each of these column products can be recycled back to D-459 to allow the distillation columns to operate continuously when reactors are off line. The bottom product from T453 is a waste stream returned to D451.

Inert gas streams are vented from the process to the vent gas compressor suction drum D-466 and then to the compressors C-450A/B. The compressed mixture of solvent and inert gas then passes to the chiller E-467 to condense the solvent which then passes to accumulator D-467 from which it is pumped back to D-459. The non condensable are vented through a kerosene scrubbing tower T-450 to atmosphere. The hydrocarbon rich kerosene passes to the flash drum D-454 where solvent is flashed off to the suction of the vent gas compressor for recovery. The kerosene is recycled back to T-450.

Crumb slurry from TK-556 is pumped to the mechanical drying line which consists of a dewatering screen, an expeller, an expander dryer and a thermal dryer to lower the residual moisture content to less than 0.75%. The dried rubber passes up a vertical conveyor for cooling and then to a baling press, film wrapper and automatic packaging machine. Air from the drying section containing residual hydrocarbon passes to an incinerator for oxidation prior to discharge to atmosphere.

BR PROCESS CHEMICALS AND UTILITIES

Description	Material	Comment
Monomer	Butadiene (C4)	99+% required. Should contain some Buten-1. Composes 20-25% of reactor feedstock
Solvent component	Butene-1 (C4)	30-35% of reactor feedstock
Solvent component	Benzene (C6)	10-15% of reactor feedstock
Solvent component	Cyclohexane (C6)	25-30% of reactor fedstock
Catalyst D-1	Di-ethyl aluminium chloride	15% solution in dry C6 that has been dried on activated alumina stored in D-155 driers DR-150
Catalyst C-1	Cobalt octoate	1.5% solution in C6 from D-453
Vent gas	Kerosene	Used as absorbing medium in T-450
Antioxidant/shortstop	BHT/Polygard HR	Solution of BHT in hot Polygard ratio 1:2
Utility - steam	8.5 barg steam	Used in CS -450, CS 451 A/B reboilers for distillation columns E453 and E456 and to drive steam turbine on ammonia refrigeration compressor
Utility - steam	1.25 barg steam	Used for E-952 and other heating
Utility - refrigeration	Ammonia	Used to cool reactors E-354 A/B/C and in vent gas chiller E-467. Closed loop refrigeration plant.
Utility - compressed air	7.5 barg air	Air compressors for instrument and plant air
Utility - water	For process, fire water and cooling water	
Utility – natural gas	Natural gas	Incinerator and plant flare pilot



1 RECYCLE + SOLVENT STORAGE.
2 BD CAUSTIC & WATER DECANTERS.
3 BD SURGE TANKS.
4 FEED BLENDING STATION.
5 BLENDED FEED DRUM.
6 DRIER DECANTER.
7 DRIER PREHEATER.
8 DRIER COLUMN.
9 DRIER CONDENSER.
10 DRIER BOTTOMS COOLER.
11 DRIER REBOILER.
12 FEED RATE CONTROL DRUM.
14 W-1 ADDITION.
15 FEED CHILLER.
16 CATALYST AGING DRUM.
17 C-1 DILUTION DRUMS.
18 EXTENDER OIL ADDITION
19 REFLUX REACTORS & PUMPS.
20 CEMENT SURGE DRUMS.
25 BLENDED CEMENT DRUM.
26 WATER ADDITION TANK.
27 SHEAR STEAM.
28 MOTIVE WATER.
29 COAGULATOR.
30 STRIPPERS
31 EXPELLER.
32 EXPANDER.
33 COAGULATION K.O.
34 COAGULATION CONDENSER.
35 RECOVERY SURGE DECANTER
36 STRIPPER CONDENSERS.
37 LOW PRESS. RECEIVER
38 SLURRY TROUGH.
39 SLURRY SURGE TANK.
40 VIBRATING SCREEN.
41 C4 COLUMN PREHEATER
42 C4 COLUMN.
43 C4 CONDENSER.
44 C4 ACCUMULATOR.
45 C4 REBOILER.
46 H.B. COLUMN.
47 H.B. CONDENSER.
48 H.B. COOLER.
49 D-1 DILUTION DRUMS
50 BALE WRAPPER.
51 A-1 SHORT STOP ADDITION
52 OFF SPEC. CEMENT DRUM.
54 THERMAL DRIER.
55 VERTICAL VIBRATING CONVEYOR.
56 RUBBER BALER
57 FINES SCRUBBER
58 FOUL GAS FAN
59 THERMAL OXIDISER
60 RECYCLE C6 STORAGE
61 C6 DRIERS & STORAGE

REV. 1 UPDATE 1995

ITEM	NAME OF PART		MATERIAL	REMARKS

Australian Synthetic Rubber Co. Ltd.
Maidstone St., Altona, Vic., Aust.

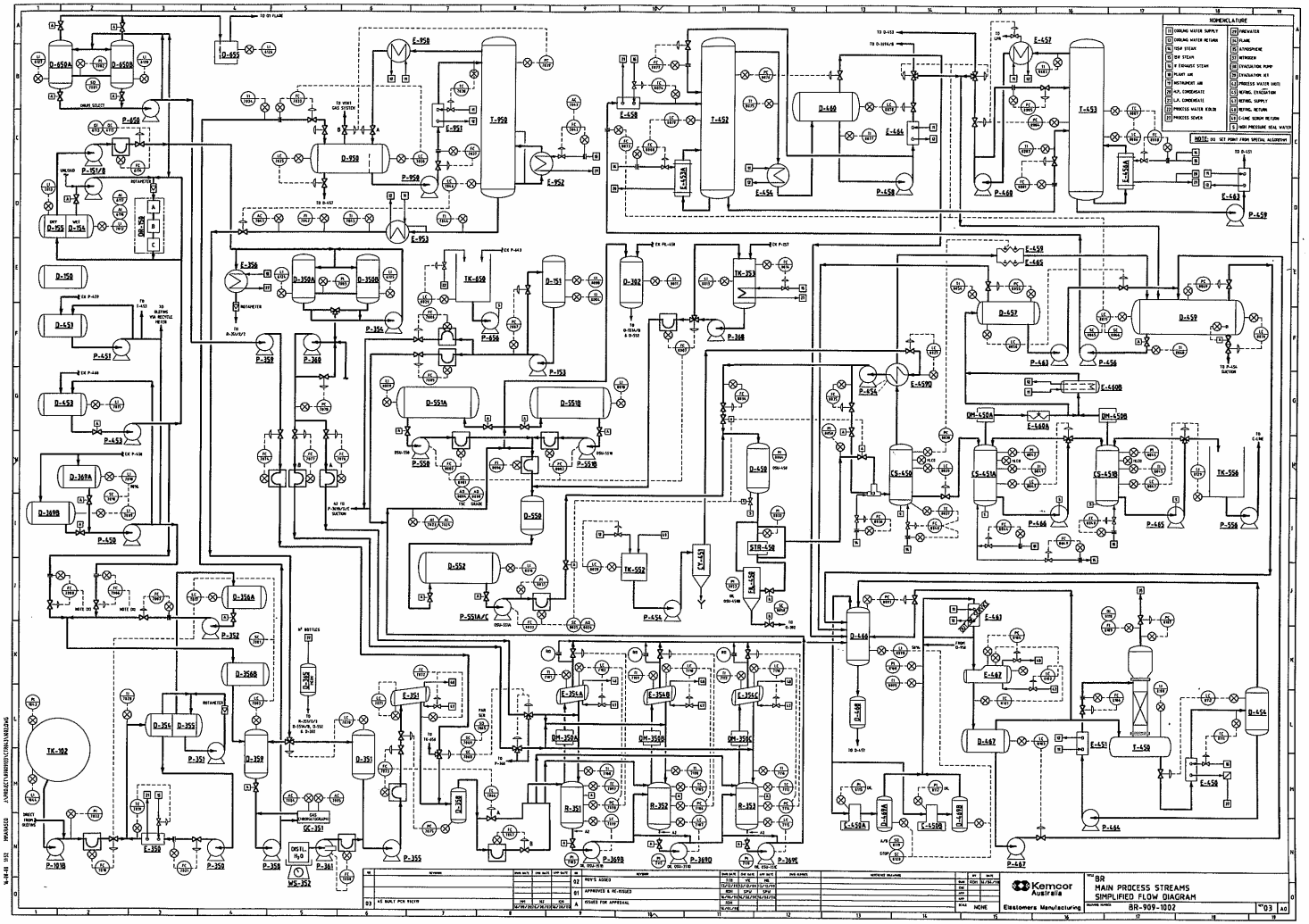
BR-909-1003

TITLE: SIMPLIFIED FLOW SHEET
BR PROCESS

AREA
EQUIP. NO.

SCALE	DRN.	DRAWING NO.	REV.
N.T.S.	B.S.	0290-01	1
DATE 14/8/84	CKD.		
	APPD.		

3344


NOMENCLATURE
COOLING WATER SUPPLY
COOLING WATER RETURN
150# STEAM
150 STEAM
EXHAUST STEAM
PLANT AIR
INSTRUMENT AIR
H/C CONDENSATE
L.P. CONDENSATE
PROCESS WATER RINSE
PROCESS SEWER
FIREWATER
FLARE
ATMOSPHERE
NITROGEN
EVACUATION PUMP
EVACUATION JET
PROCESS WATER INLET
REFRIG. EVAPORATOR
REFRIG. SUPPLY
REFRIG. RETURN
FLARE HEADER RETURN
HIGH PRESSURE SEAL WATER
NOTE: DO SET POINT FROM SPECIAL ALGORITHM
BR
MAIN PROCESS STREAMS
SIMPLIFIED FLOW DIAGRAM
BR-909-1002
Kemcor Australia
Elastomers Manufacturing
NONE
03
A0