

QENOS ELASTOMERS MANUFACTURING

STYRENE BUTADIENE PLANT PROCESS DESCRIPTION TO BE READ WITH REFERENCE TO DRAWING SBR-909-1003 and SBR-909-1004

POLYMERISATION

Technology: Goodyear emulsion free radical polymerisation

Fresh butadiene (99% purity) is received by pipeline from the Olefins plant into TK-102. This butadiene is blended with a recycle stream stored in TK-103 to form a 94% purity blend in TK-101. The blend butadiene is charged to the caustic decanter D-304 and water decanter D-305 where polymerisation inhibitor is removed and then passes to the reactor chain. Fresh styrene is received by road tanker into storage tanks TK-107/108 and is blended with a recycle stream (TK-106) in blend tanks (TK-104/105). The blend styrene is then charged to the reactor chain. Modifier (TK-307) is added to the styrene prior to mixing with the butadiene stream.

The combined stream of butadiene, styrene and modifier is mixed with a soapy water stream at the inlet of the first reactor (R300). This soapy water is formed by mixing a concentrated soap stream (TK-301) with dilution water (TK-302). The concentrated soap consists of a mixture of Rosin soap, fatty acids, oleic acid and caustic soda (TK-208,219,223 and 216) as well as an activator solution added to it (TK-221). The polymerisation reaction commences with the addition of the oxidant (TK-311) to the first vessel in the reaction chain (R-300).

The combined charge stream then passes through up to 8 reactors and 2 control reactors (R-310 and R-311) before reaching the target conversion of about 65%. The polymerisation reaction is stopped by addition of a shortstop solution (TK-303) to the control reactors. The reaction product, latex, is a white milky liquid and passes from the final reactor to the blowdown drum (D-301) to commence the recovery of unreacted monomer.

RECOVERY

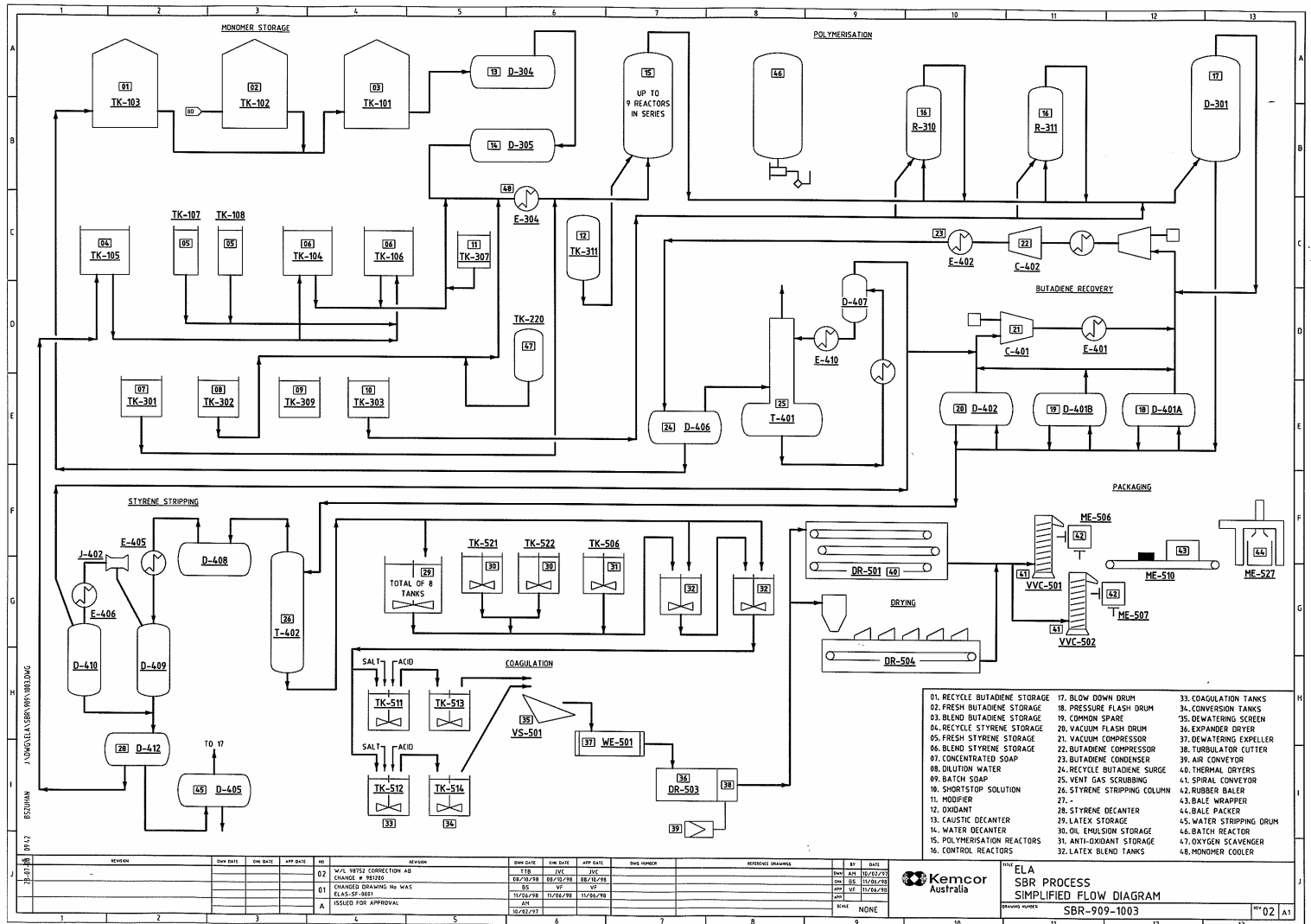
Live steam injected to the blowdown drum provides heat to evaporate unreacted butadiene in the pressure flash drum (D-401A). Recovered butadiene is removed by compressor C-402 and condensed E-402 then passing to an accumulator D-405. The recovered butadiene is recycled to TK-103. The latex stream passes from the pressure flash drum to the vacuum flash drum D-402 for complete recovery of butadiene before passing to the styrene stripping column T-402A/B. In this column unreacted styrene is recovered by vacuum live steam distillation with a steam styrene mixture passing overhead to a condenser (E405 and the bottom latex stream passing to latex storage tanks. The vacuum for the styrene recovery system is supplied by compressors C-401 which discharge non – condensables to C-402. Any non-condensables are removed from the butadiene system by the vent gas absorber T-401 and are vented to atmosphere.

FINISHING

Latex from storage is continuously blended with antioxidant (TK-506) and if required extender oil (TK521 and TK-522) into blend tanks (TK-503 and TK-504). The antioxidant is made by reacting phenol (D-201), sulphuric acid (D-202) and polyamine (D-203) with fresh styrene in the styrenated phenol reactor R-201.: the extender oil is an emulsion of oil (TK-210/213) and caustic soda solution (TK-216). From storage the latex is pumped to coagulation (TK511 and TK512) where salt solution and acid are added to recover the rubber. The slurry of rubber in mother liquor passes via the creaming box through a surge tank TK 513/514 to the vibrating screen (VS-501) and water expeller WE-501 and thermal dryer DR-501... The moisture content is reduced to 0.5% before the rubber passes via the spiral conveyor VVC-501 to the packaging area.

SBR CHEMICALS AND UTILITIES

Description	Material	Comment
Monomer	Butadiene	
Monomer	Styrene	Styrene composes 23.5% of finished rubber
Modifier	Do-decyl mercaptan	Chain transfer agent
Activator	Ferrous sulphate heptahydrate Sodium formaldehyde sulphonylate Sodium ethylene diamine tetra acetate	Free radical polymerization
Oxidant	Paramenthane hydroperoxide	
Oxygen scavenger	Sodium hydrosulphite	
Shortstop	Pennstop/SDMC	
Defoamer		Used in styrene stripping column
Inhibitor	PTBC	Dissolved in styrene and added to recycle monomer streams
Acid	Sulphuric acid	98% concentration
Brine solution	NaCl	Saturated solution in water
Soaps	Rosin / fatty acid	Choice depends on grade of rubber
Antioxidant	Styrenated phenol or Wngstay S	
Extender oil	Aromatic or Napthenic	Depending on grade
Caustic	NaOH	20% solution
Utility - refrigerant	Ammonia	Used to cool the polymerisation reactors to 5 degrees Celsius by evaporating inside tube banks within the reactor. Closed loop refrigeration system shared with the BR plant
Utility -steam	8.5 barg	For heating in D-301 and steam for ammonia compressor turbine
Utility- steam	1.25 barg	For styrene stripping column
Utility - air	7 barg	Plant air and instrument air
Utility - water	Cooling tower	
Utility – natural gas	Natural gas	For rubber dryer



REV	DESCRIPTION	CHK DATE	CHK NAME	APP DATE	APP NAME
02	W/L 98752 CORRECTION AS CHANGED # 00120	08/29/98	JVC	08/28/98	JVC
01	CHANGED DRAWING NO WAS ELAS-SP-0001	11/26/98	VS	11/26/98	VS
A	ISSUED FOR APPROVAL	12/22/97	DR	12/22/97	DR

ELAS SBR PROCESS SIMPLIFIED FLOW DIAGRAM
 DRAWING NUMBER: SBR-909-1003

