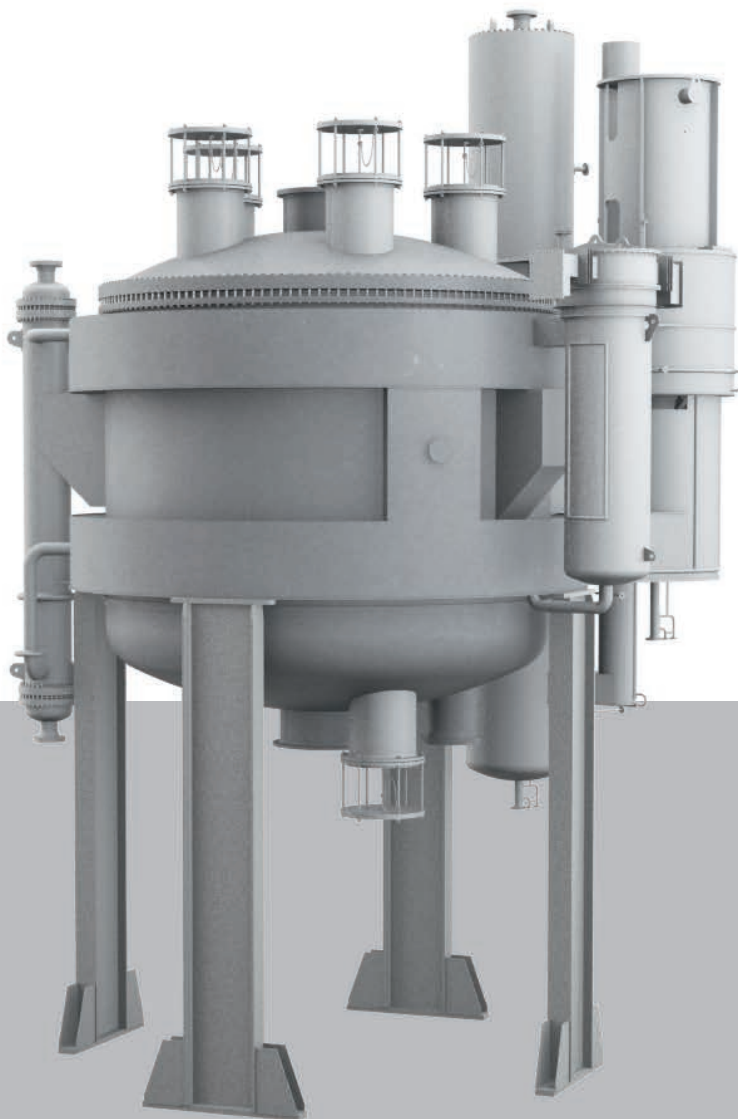


Salt operated reactors

Acrylic Acid



DWE® – global no. 1 in tubular reactors

- First reactor in 1955
- More than 750 contracts
- up to 45,000 tubes
- heat removal up to 40 MW
- Salt flow up to 11,000 m³/h
- More than 750 catalytic gas phase tubular reactors for 54 products and use of 77 different processes
- 28 Deflagration pressure containment design reactors
- Up-scale from pilot test (1-2 tube) to commercial reactor size with same salt temperature conditions



Market leader for AA reactors

- 140+ reactor systems manufactured until today
- AA via Propylene
- Tandem design and single design with two stages feasible
- Loading
- Propylene 8 - 10 Mol %, space velocity max. 150 1/h
- Type of construction of reactor stage 1
- With integrated quench (reaction and quench in one tube)
- With separate quench (quench flanged to reactor) - "Unique DWE®-Design"
- Biggest tube number: up to 50,000

Acrylic Acid (AA) reactor

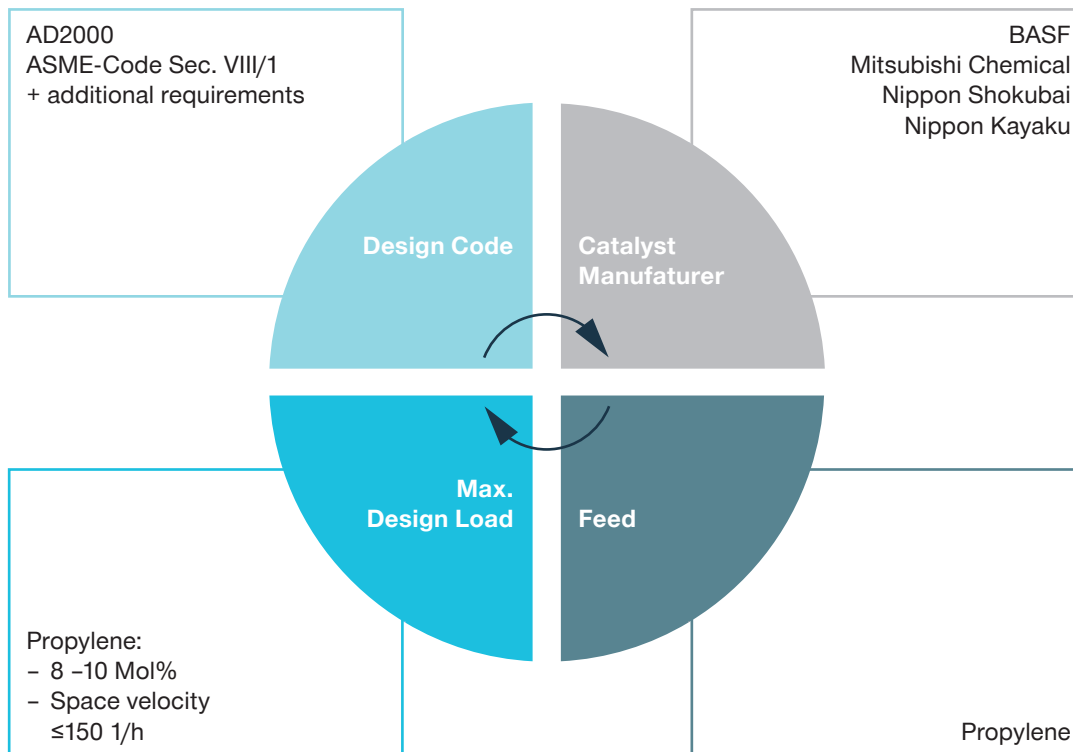
Technical data

Standard design / operating data for stage 1 and stage 2

Design data	Design	Operating
Pressure tube side	1.5 barg – 4.0 barg	0.5 barg – 2.1 barg
Temperature tube side	390 °C – 420 °C	250 °C – 360 °C
Pressure shell side	1.5 barg – 4.0 barg	0.5 barg – 2.1 barg
Pressure shell side	static + pump	static + pump
Temperatur shell side	350 °C – 400 °C	270 °C – 380 °C

Characteristic design data (stage 1 and stage 2)

Design data	Stage 1 (Feed: Propylene)	Stage 2 (Feed: Acrolein)
Space velocity	max. 150 1/h	ID21 mm – ID27 mm
Inner tube diameter	ID21 mm – ID27 mm	ID21 mm – ID27 mm
Tube length over tube sheets	approx. 3,500 mm (without separate quench), approx. 4,900 mm (withour integrated quench)	approx. 3,300 mm – 3,600 mm
Tube length between tube sheets	approx. 3,200 mm (without separate quench), approx. 4,600 mm (without integrated quench)	approx. 3,100 mm – 3,300 mm
Amount of heat to salt per tube	max. 1,100 W	max. 700 W
Yield	85 %	
ACS per tube and hour	0.58 kg	
Max. tube number per reactor	50,000	50,000



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