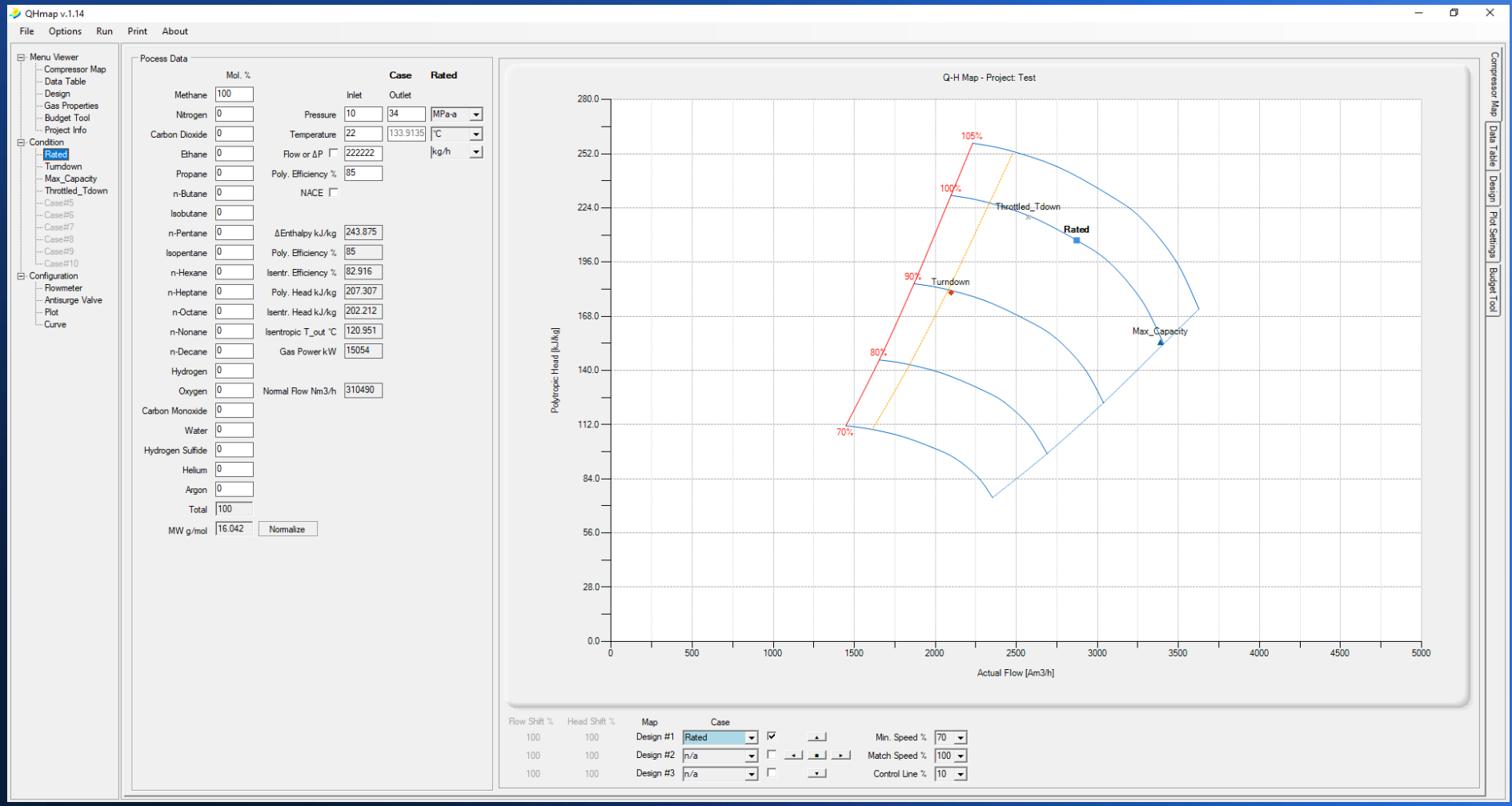
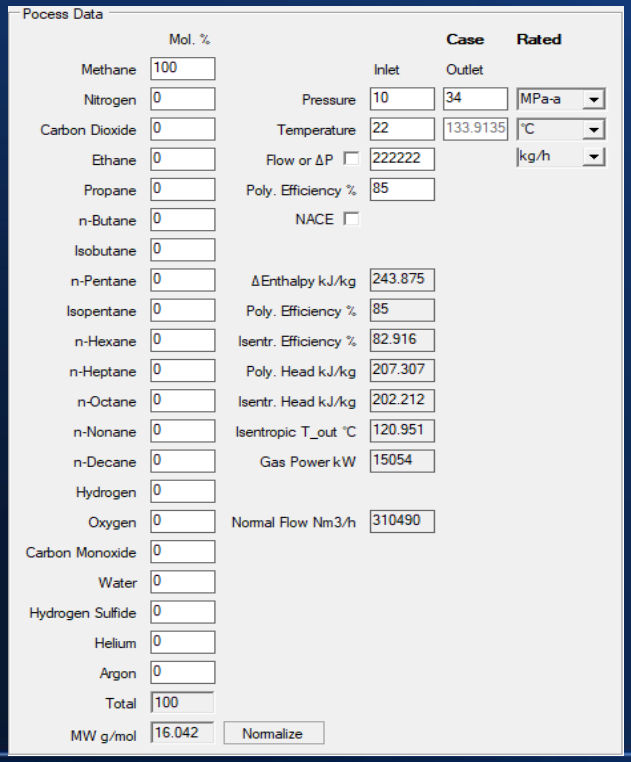
QHmap Software for Centrifugal Compressor Preliminary Selection and Sizing



Input Process Conditions

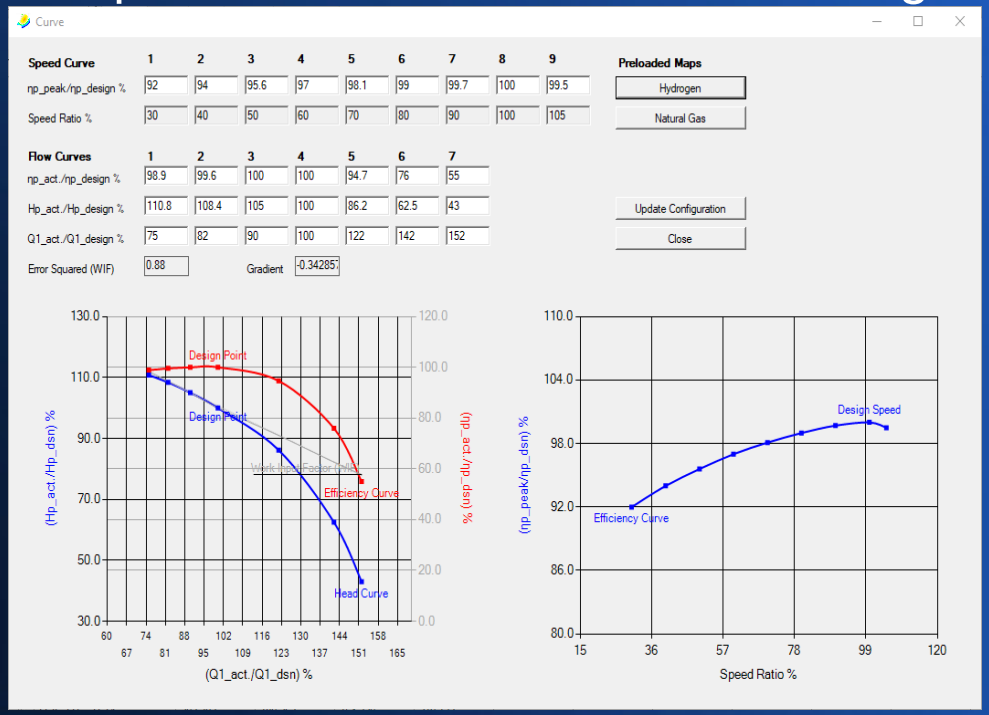
- Enter process condition either from input mask or data table (copy/paste from Excel)
- Up to 10 operating cases available (design and alternative cases)



Description	Case#1	Case#2	Case#3	Case#4	Case#5	Case#6	Case#7	Case#8	Case#9	Case#10
Case Name	Rated	Turndown	Max_Capacity	Throttled_Tdo...						
Inlet Pressure MPa-a	10	10	10	8.34						
Inlet Temperature °C	22	22	22	22						
Flow kg/h	222222	162222	262222	162222						
Outlet Pressure MPa-a	34	30	26	30						
Outlet Temperature °C	133.9135	121.7034	118.5379	141.4715						
Molecular Weight g/mol	16.042	16.042	16.042	16.042						
Gas Composition mol %										
Methane	100	100	100	100						
Nitrogen	0	0	0	0						
Carbon Dioxide	0	0	0	0						
Ethane	0	0	0	0						
Propane	0	0	0	0						
n-Butane	0	0	0	0						
Isobutane	0	0	0	0						
n-Pentane	0	0	0	0						
Isopentane	0	0	0	0						
n-Hexane	0	0	0	0						
n-Heptane	0	0	0	0						
n-Octane	0	0	0	0						
n-Nonane	0	0	0	0						
n-Decane	0	0	0	0						
Hydrogen	0	0	0	0						
Oxygen	0	0	0	0						
Carbon Monoxide	0	0	0	0						
Water	0	0	0	0						
Hydrogen Sulfide	0	0	0	0						
Helium	0	0	0	0						
Argon	0	0	0	0						
Gas Power kW	*15054*	*9556*	*15416*	*11619*						
Poly. Head kJ/kg	*207.307*	*180.267*	*154.720*	*219.177*						
Inlet Flow Am3/h	*2872*	*2097*	*3389*	*2574*						
Poly. Efficiency %	*85*	*85*	*73.1*	*85*						
Massflow kg/h	*222222*	*162222*	*262222*	*162222*						
Outlet Flow Am3/h	*1458*	*1131*	*2040*	*1204*						
Shifted Head kJ/kg	*207.307*	*180.267*	*154.720*	*219.177*						
Shifted Flow kg/h	*222222*	*162222*	*262222*	*162222*						

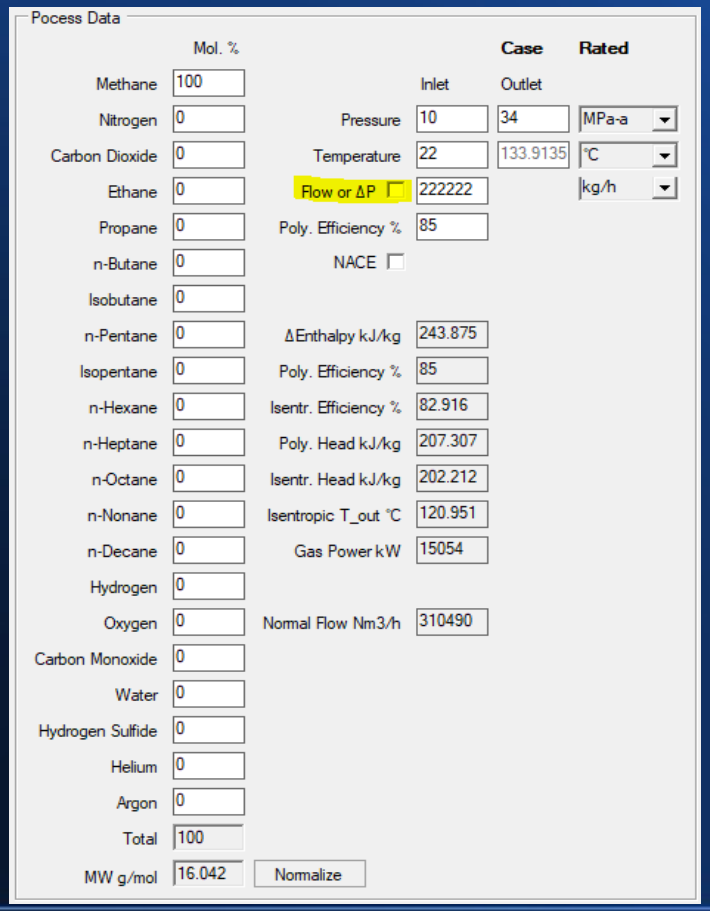
Customize Master Curves

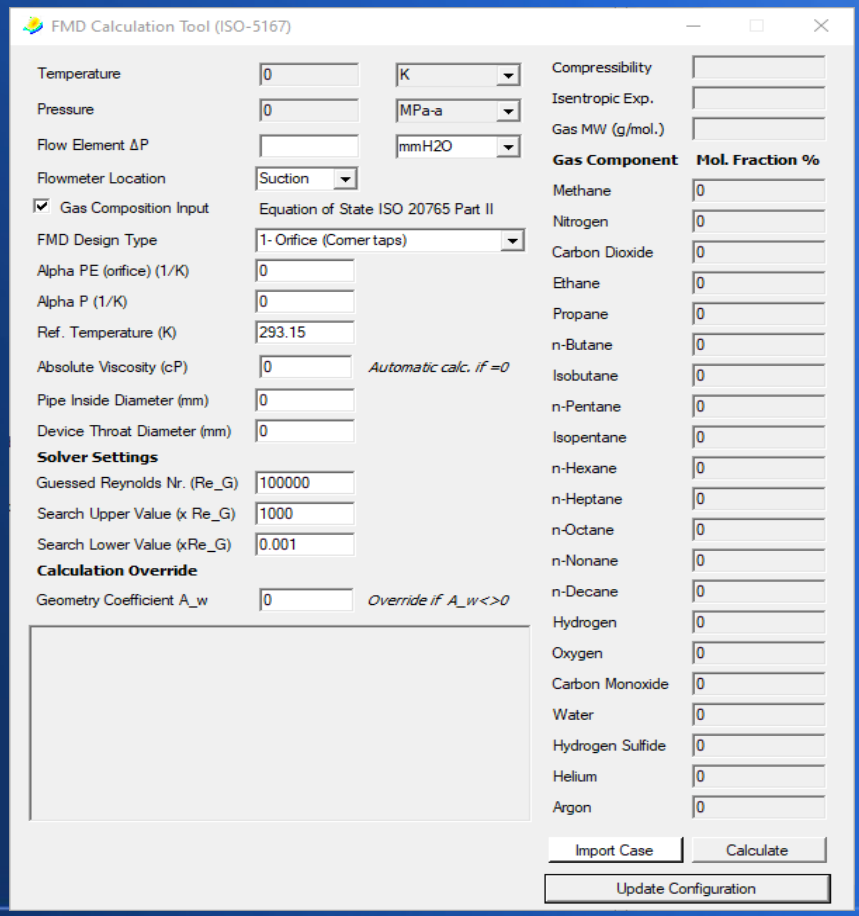
- Master curves define the shape of the preliminary maps
- Use predefined curves to quickly generate some maps
- Customize, if needed, master curves to suit specific service based on reference map available or make an educated guess



Configure Flow Meter

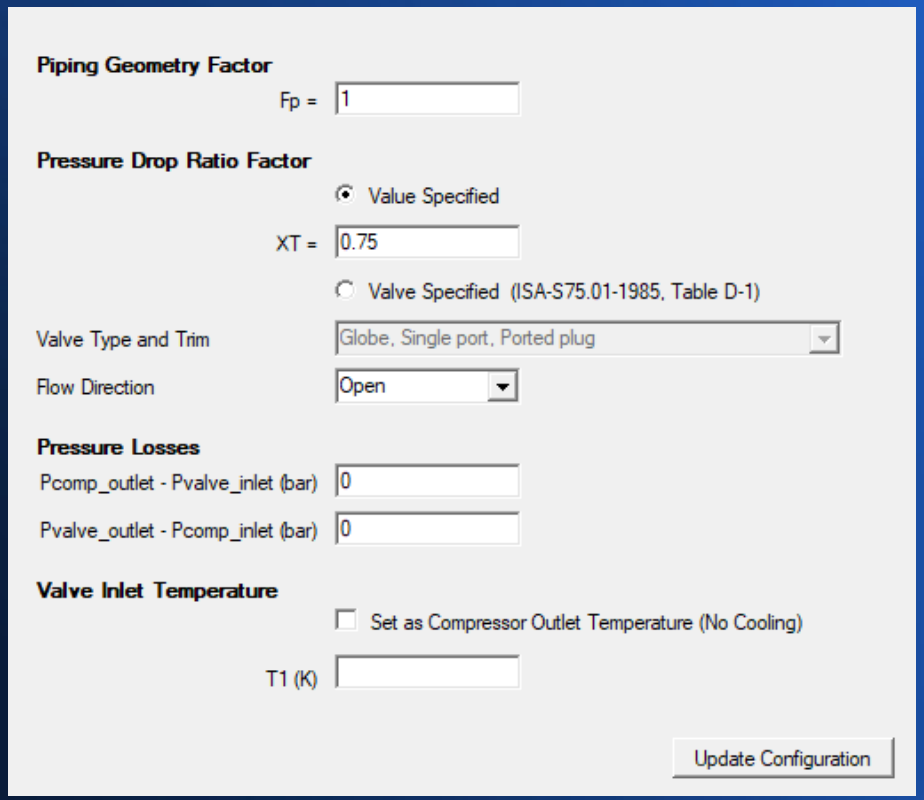
- If the flow value is specified in terms of pressure differential measurement, configure the flow meter parameters (ISO 5167)





Configure Antisurge Valve

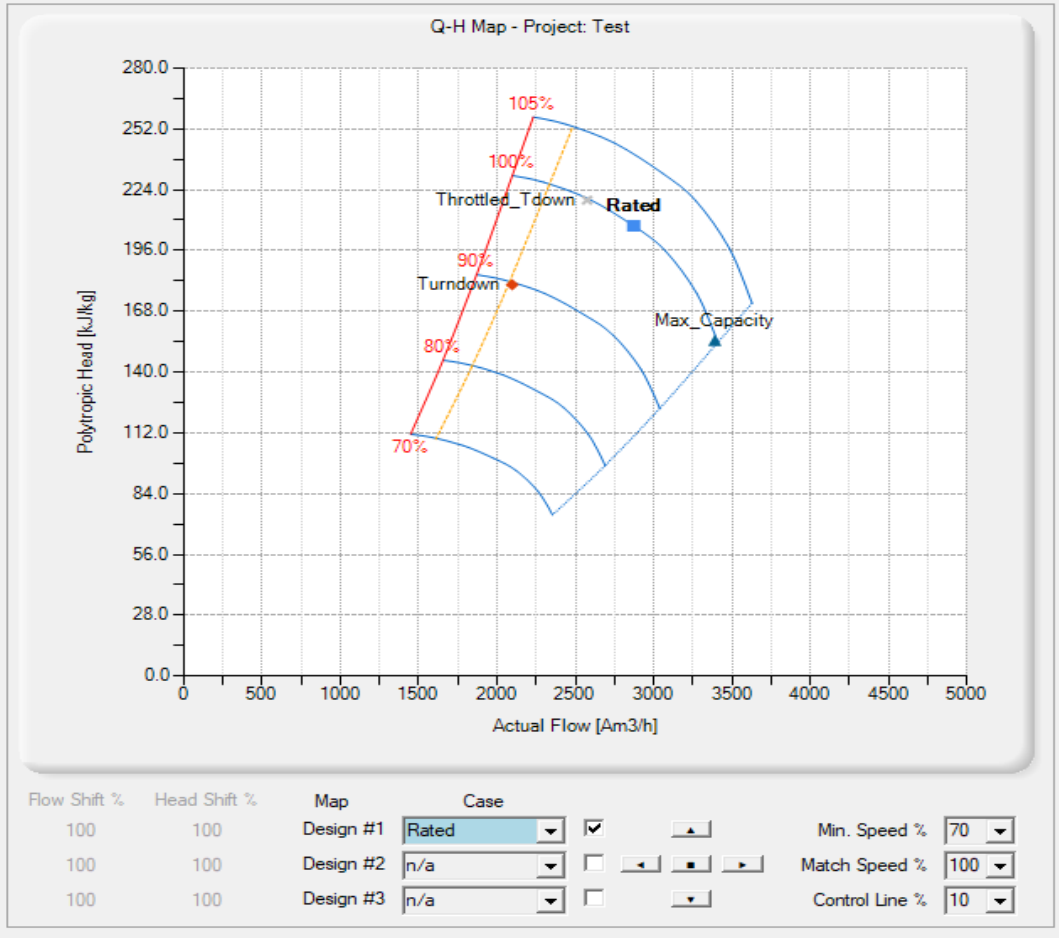
- Configure antisurge valve charateristics (ISA-S75.01-1985) to let the tool automatically calculates valve Cv's at surge and choke at minimum operating and maximum continuous speeds.



Calculate Duty Point and Plot Preliminary Map (1/2)

Pocess Data

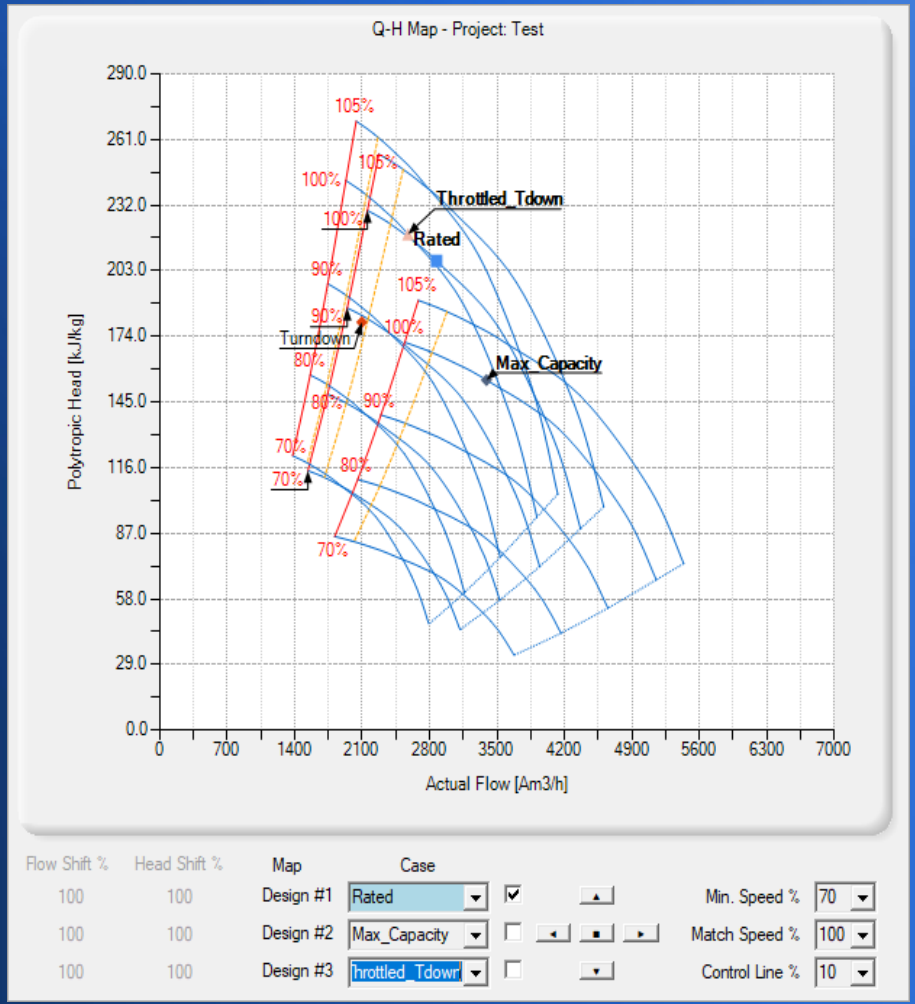
	Mol. %		Case Inlet	Case Outlet	Rated
Methane	100				
Nitrogen	0	Pressure	10	34	MPa-a
Carbon Dioxide	0	Temperature	22	133.9135	°C
Ethane	0	Flow or ΔP ☐	222222		kg/h
Propane	0	Poly. Efficiency %	85		
n-Butane	0	NACE ☐			
Isobutane	0				
n-Pentane	0	ΔEnthalpy kJ/kg	243.875		
Isopentane	0	Poly. Efficiency %	85		
n-Hexane	0	Isentr. Efficiency %	82.916		
n-Heptane	0	Poly. Head kJ/kg	207.307		
n-Octane	0	Isentr. Head kJ/kg	202.212		
n-Nonane	0	Isentropic T_out °C	120.951		
n-Decane	0	Gas Power kW	15054		
Hydrogen	0				
Oxygen	0	Normal Flow Nm3/h	310490		
Carbon Monoxide	0				
Water	0				
Hydrogen Sulfide	0				
Helium	0				
Argon	0				
Total	100				
MW g/mol	16.042	Normalize			



Flow Shift %	Head Shift %	Map	Case				
100	100	Design #1	Rated	☑		Min. Speed %	70
100	100	Design #2	n/a	☐		Match Speed %	100
100	100	Design #3	n/a	☐		Control Line %	10

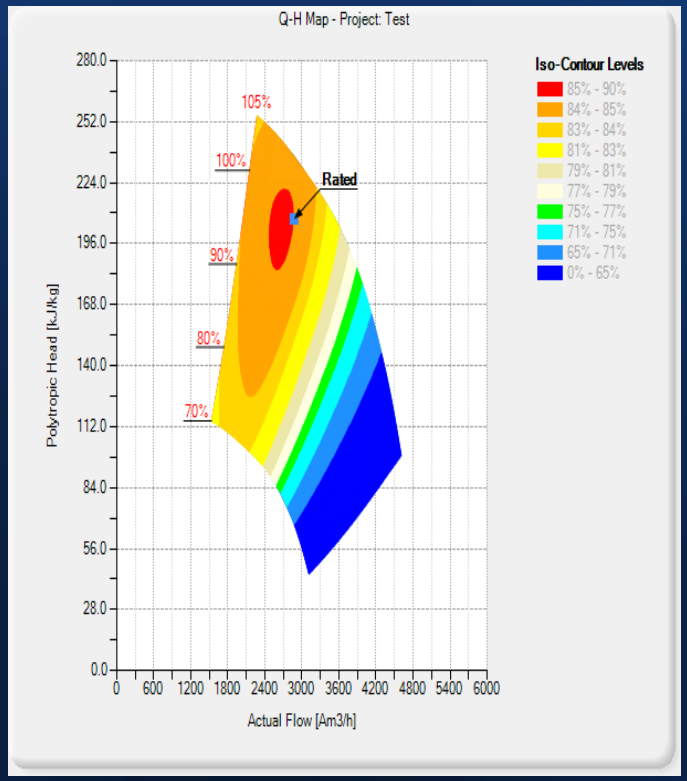
Calculate Duty Point and Plot Preliminary Map (2/2)

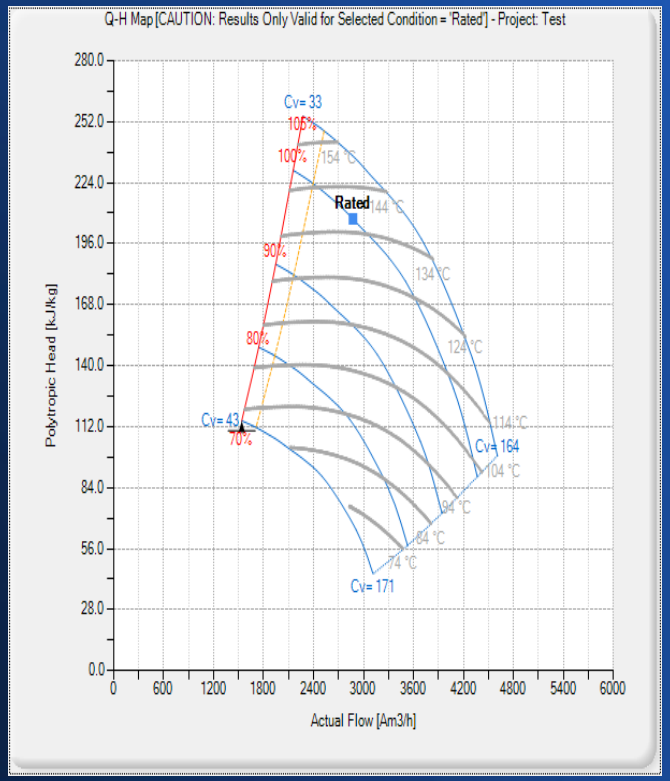
- Operating speed range can be adjusted (e.g., 70 to 105%)
- Antisurge control line can be adjusted by % (distance from surge line)
- Movable curve can be adjusted by speed %
- Design point can be shifted (volumetric and/or head)
- Up to 3 maps (design) can be visualized

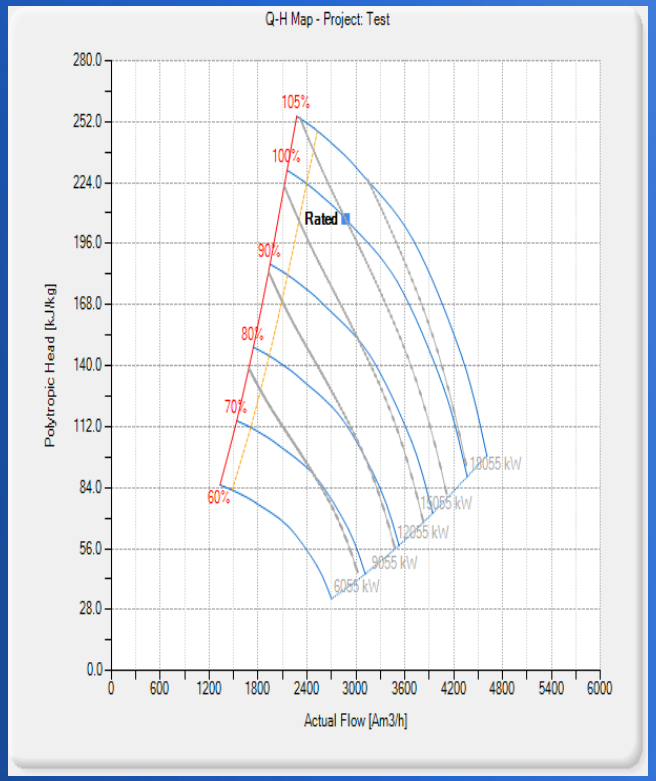


Contour Plot and Iso-Curves

- Plot contours for iso-efficiencies (after specifying levels) and iso-curves for power and temperatures
- Display efficiency values (labels) across the maps and AS valve Cv's







Preliminary Sizing

- Make a preliminary estimate of compressor frame size
- Adjust number of impellers and speed to match feasible /realistic selection (from rotor dynamics stand point / user experience required)