Compressor Simulation

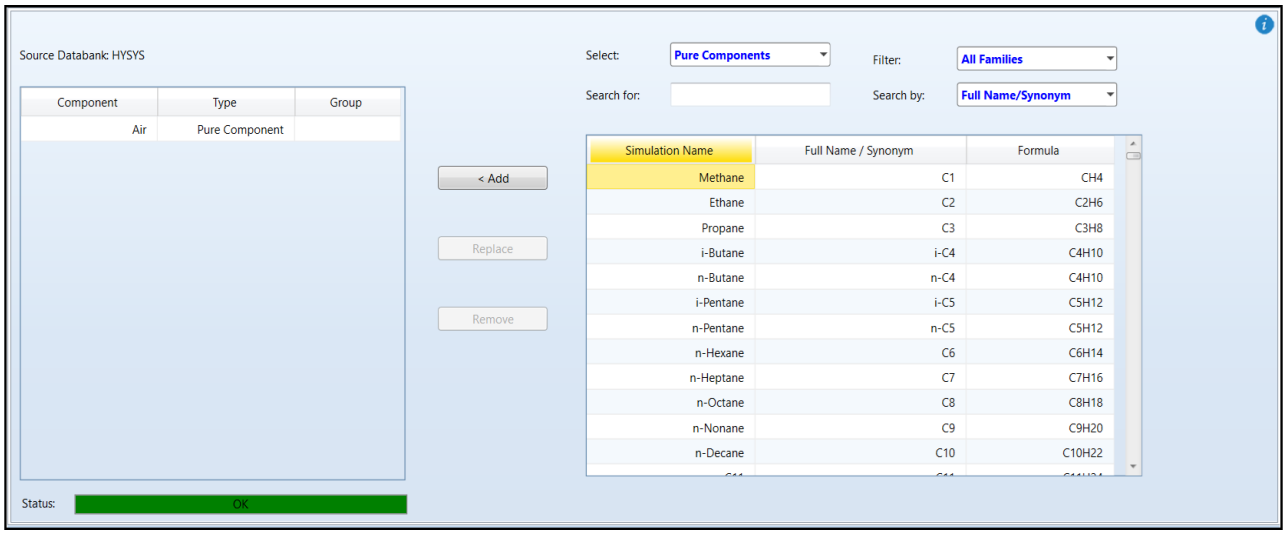
Example: A utility process plant is designed to supply Plant Air or PA to nearby petrochemicals. Process engineers want to develop the datasheet for the compressor needed to supply a 7-bar-compressed air. Here are the operating conditions of the PA at the compressor suction:

1. Operating pressure of 98 kPa.
2. Operating temperature of 45C.
3. Flowrate of 423 kmole/hr.

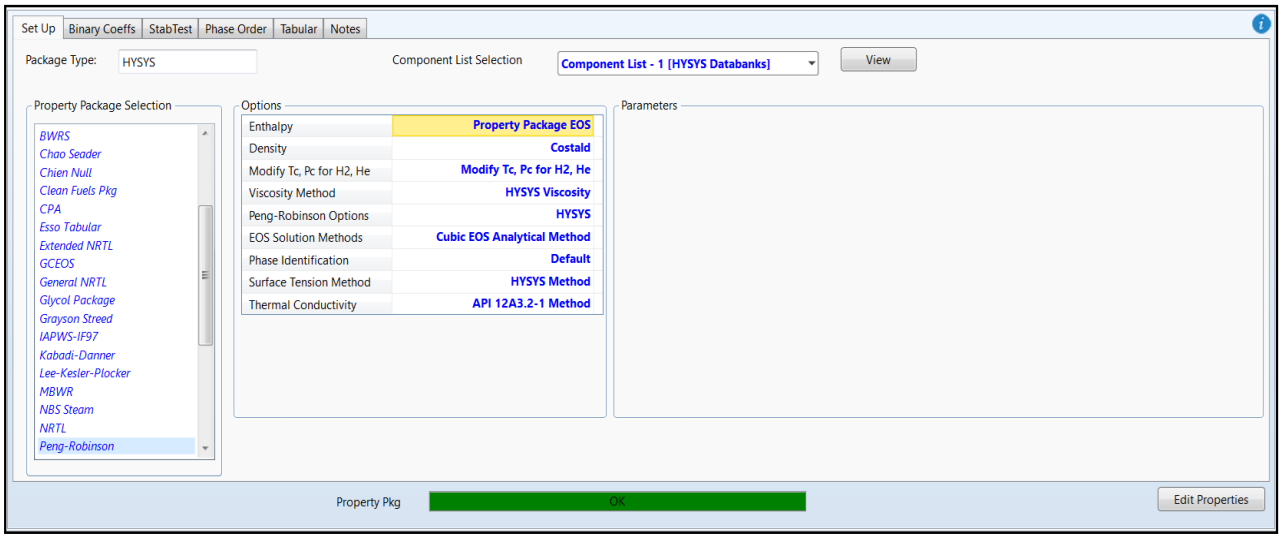
Use Aspen Hysys to calculate to the duty required with the assumption of 85% compressor efficiency.

How to simulate:

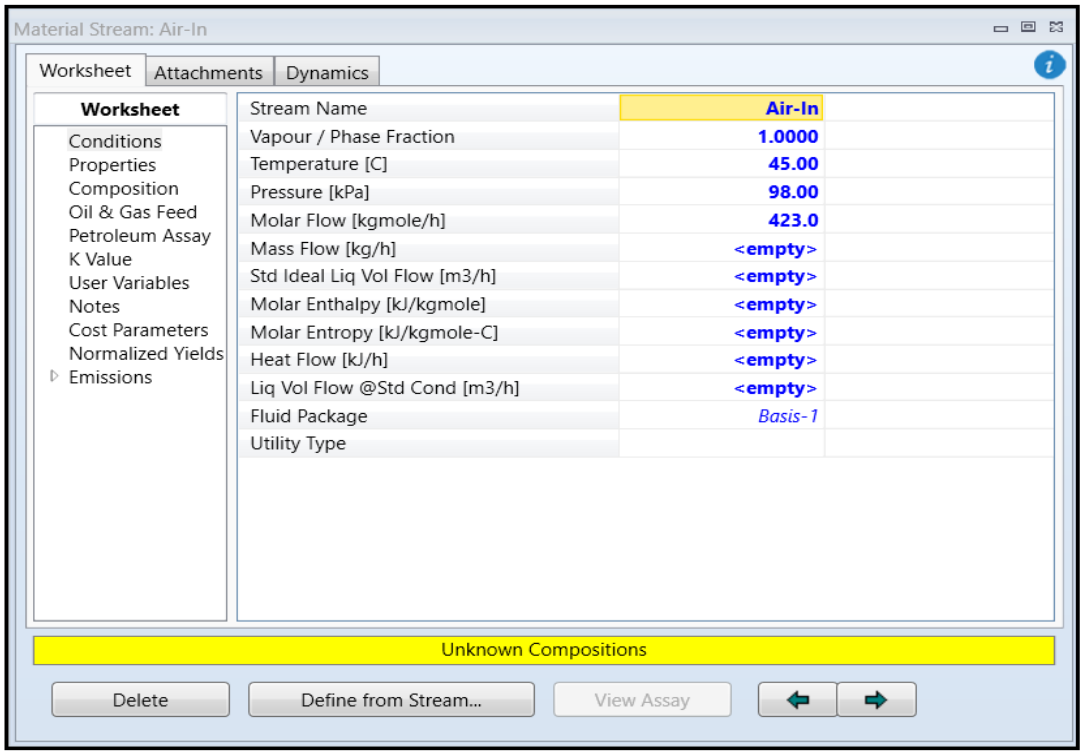
1.Add air as the component in component list.

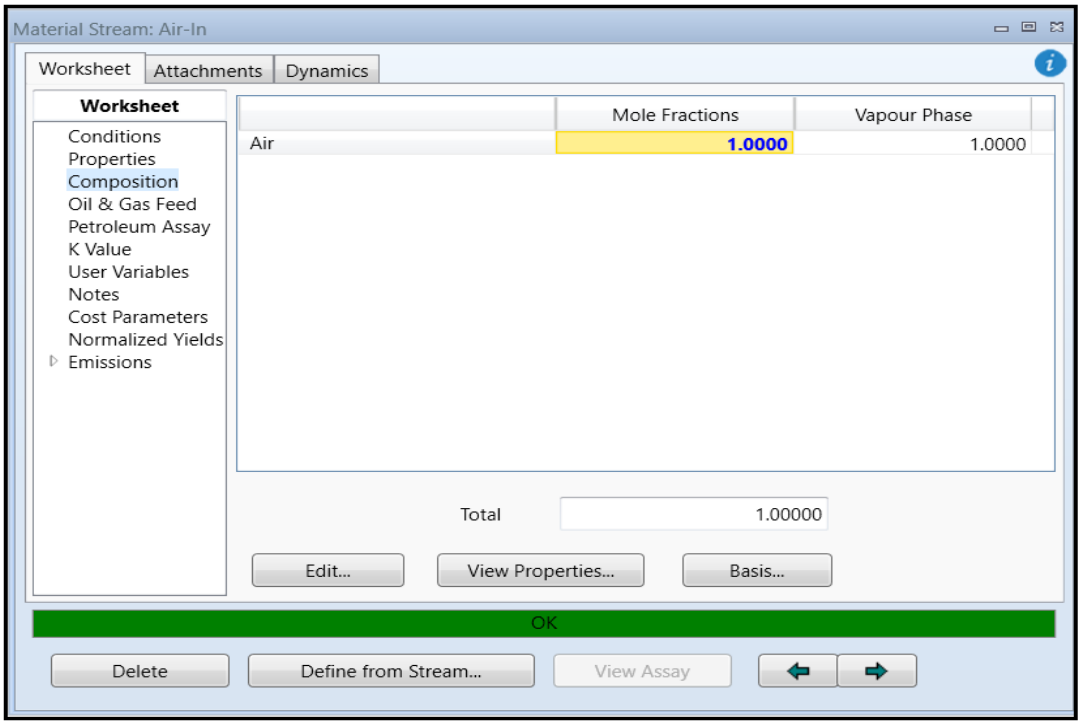


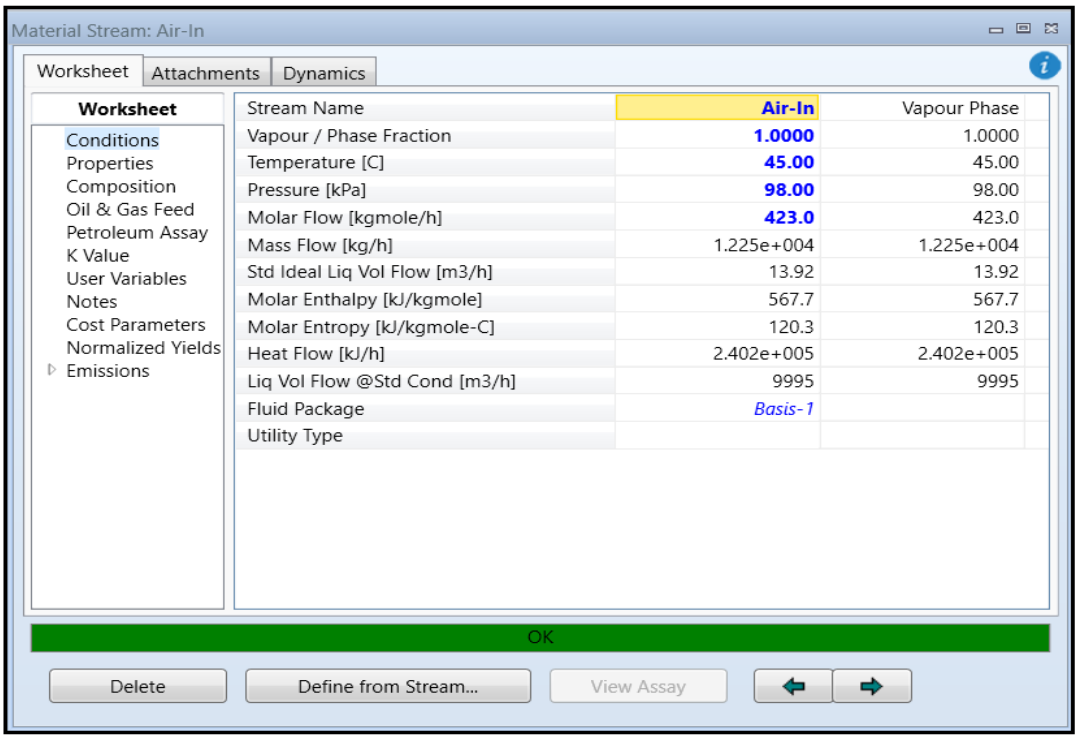
2.Select PR as Fluid Package for such system.



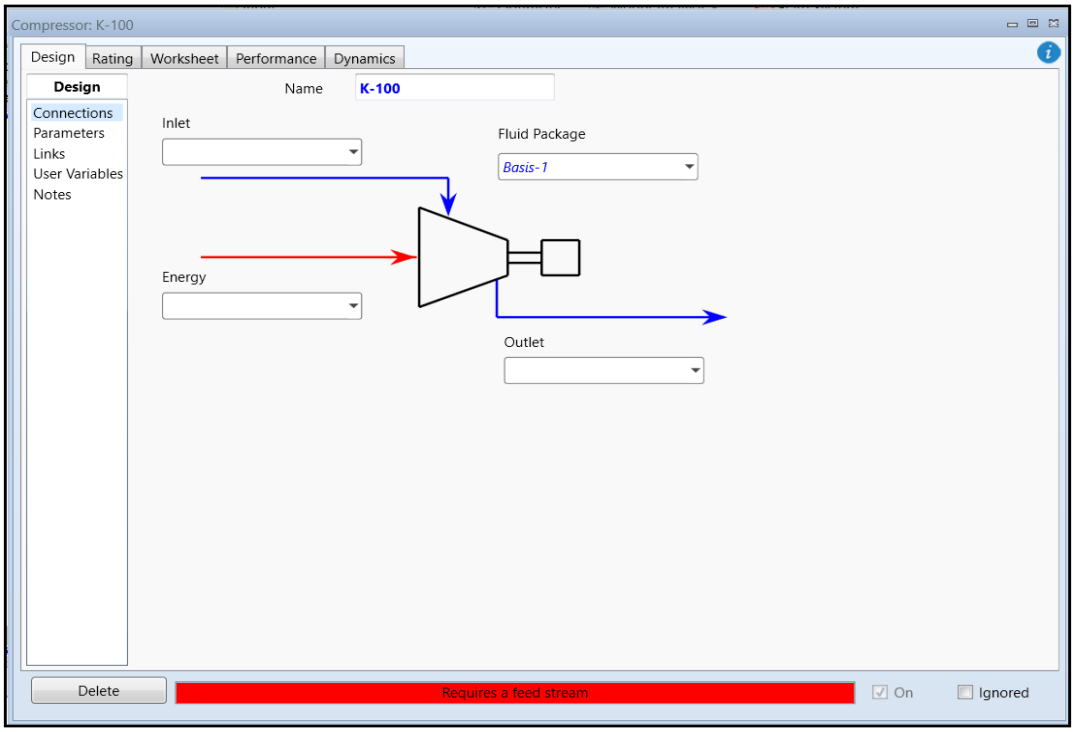
3.Enter Simulation Environment and define a stream named Air-In with aforementioned conditions.



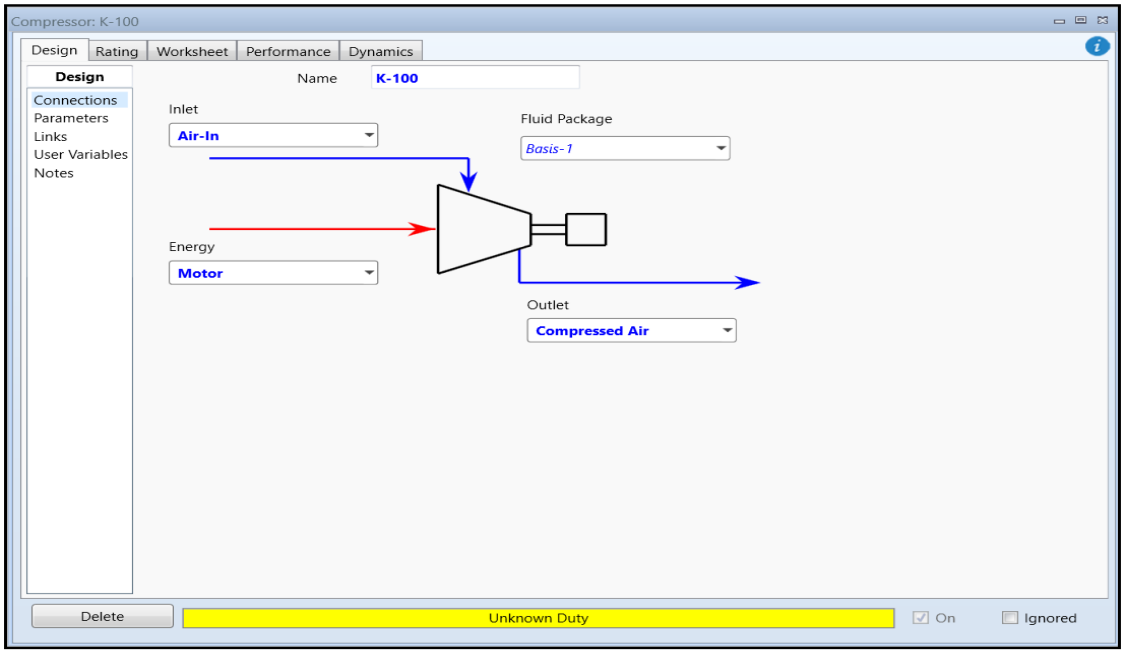




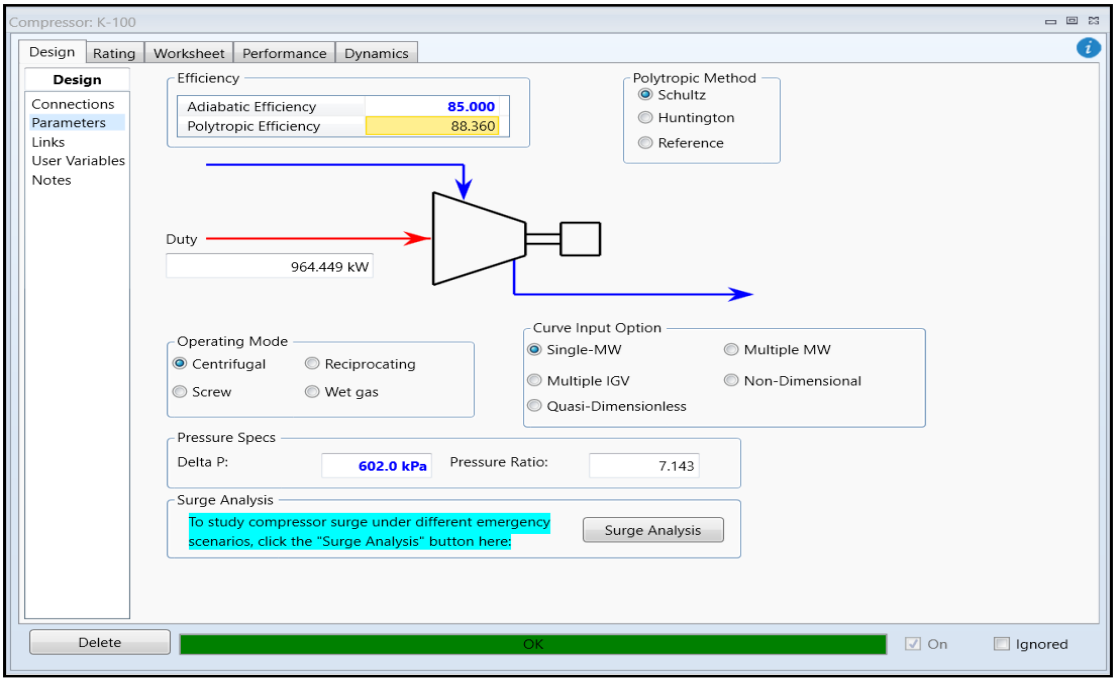
4.Select compressor icon from Model Pallete/Pressure Change



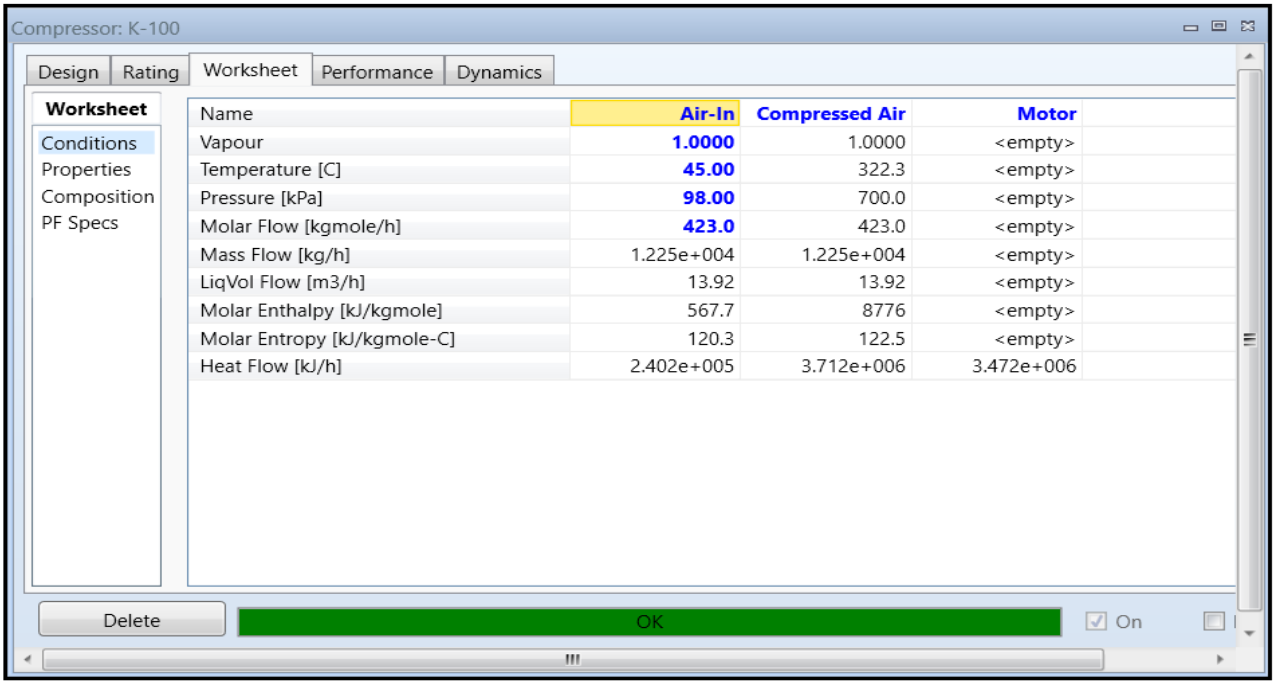
5.Select Air-In as the inlet stream and define Compressed Air as the outlet stream. Also, define an energy source named Motor.



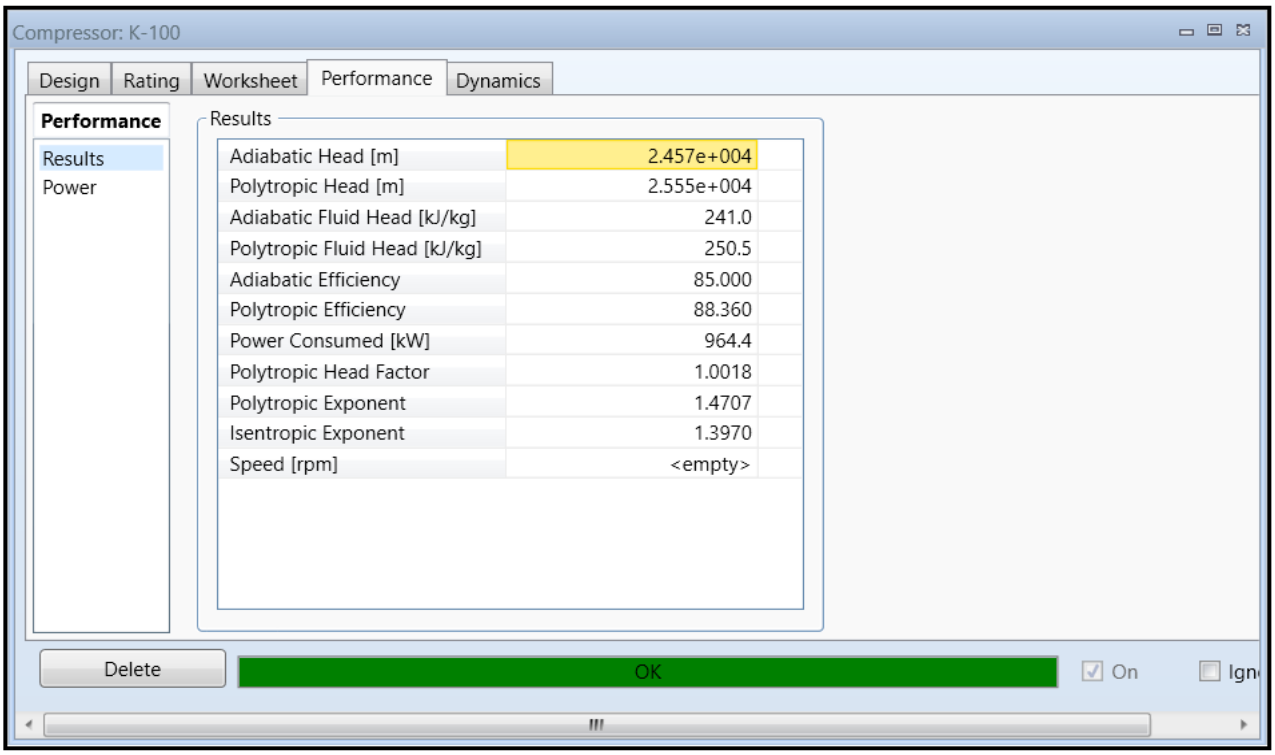
6.Go to Parameter sheet, change the efficiency to 85% and set delta P to 602 kPa.



Based on the result, the calculated duty is 964.44 kW. Also, it is worthy checking the Worksheet tab and observe the dramatic increase in outlet temperature from 45C to 322C.



Name	Air-In	Compressed Air	Motor
Vapour	1.0000	1.0000	<empty>
Temperature [C]	45.00	322.3	<empty>
Pressure [kPa]	98.00	700.0	<empty>
Molar Flow [kgmole/h]	423.0	423.0	<empty>
Mass Flow [kg/h]	1.225e+004	1.225e+004	<empty>
LiqVol Flow [m3/h]	13.92	13.92	<empty>
Molar Enthalpy [kJ/kgmole]	567.7	8776	<empty>
Molar Entropy [kJ/kgmole-C]	120.3	122.5	<empty>
Heat Flow [kJ/h]	2.402e+005	3.712e+006	3.472e+006



Adiabatic Head [m]	2.457e+004
Polytropic Head [m]	2.555e+004
Adiabatic Fluid Head [kJ/kg]	241.0
Polytropic Fluid Head [kJ/kg]	250.5
Adiabatic Efficiency	85.000
Polytropic Efficiency	88.360
Power Consumed [kW]	964.4
Polytropic Head Factor	1.0018
Polytropic Exponent	1.4707
Isentropic Exponent	1.3970
Speed [rpm]	<empty>