Compressor Calculations: Rigorous Using Equation of State vs Shortcut Method

In this tip of the month (TOTM) we will present the compressor calculations of a case study. We will compare the rigorous method results with the values from the short cut methods. The rigorous method is based on an equation of state like the Soave-Redlich-Kwong (SRK) for calculating the required enthalpies and entropies. The enthalpies and entropies are used to determine the power requirement and the discharge temperatures. The results indicate that the accuracy of the shortcut method is sensitive to the value of heat capacity ratio, k.

Power Calculations

The theoretical power requirements are independent of compressor type; the actual power requirements vary with the compressor efficiency. In general the power is calculated by:

$$\frac{Power}{Stage} = \frac{(\dot{m})(h_2 - h_1)}{Efficiency} \qquad (1)$$

where mass flow rate and h is specific enthalpy.

From a calculation viewpoint alone, the power calculation is particularly sensitive to the specification of flow rate, inlet temperature and pressure, and outlet pressure. Gas composition is important but a small error here is less important providing it does not involve the erroneous exclusion of corrosive components. A compressor is going to operate under varying values of the variables affecting its performance. Thus the most difficult part of a compressor calculation is specification of a reasonable range for each variable and not the calculation itself. Reference [1] emphasizes that using a single value for each variable is not the correct way to evaluate a compression system.

Normally, the thermodynamic calculations are performed for an ideal (reversible process). The results of a reversible process are then adapted to the real world through the use of an efficiency. In the compression process there are three ideal processes that can be visualized: 1) an isothermal process, 2) an isentropic process and 3) a polytropic process. Any one of these processes can be used suitably as a basis for evaluating compression power requirements by either hand or computer calculation. The isothermal process, however, is seldom used as a basis because the normal industrial compression process is not even approximately carried out at constant temperature.

For an isentropic (reversible and adiabatic) process, equation 1 can be written as:

$$\frac{Power}{Stage} = \left(\frac{k}{k-1}\right)\left(\frac{T_1 Z_a}{\eta}\right)(q)\left(\frac{P_s}{T_s}\right)\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{k-1}{k}\right)} - 1\right] \qquad (2A)$$

and based on the polytropic process:

$$\frac{Power}{Stage} = \left(\frac{n}{n-1}\right)\left(\frac{T_1 Z_a}{\eta_p}\right)(q)\left(\frac{P_s}{T_s}\right)\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{n-1}{n}\right)} - 1\right] \qquad (2B)$$

The isentropic head is calculated by equation 3A:

$$Head_{Isen} = \left(\frac{k}{k-1}\right)\left(\frac{Z_a R T_1}{MW}\right)\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{k-1}{k}\right)} - 1\right] \qquad (3A)$$

Similarly, the polytropic head is calculated by equation 3B:

$$Head_{Poly} = \left(\frac{n}{n-1}\right)\left(\frac{Z_a R T_1}{MW}\right)\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{n-1}{n}\right)} - 1\right] \qquad (3B)$$

The actual discharge temperature based on the isentropic path is calculated by equation 4A.

$$T_2 \approx T_1\left[1 + \frac{\left(\frac{P_2}{P_1}\right)^{\left(\frac{k-1}{k}\right)} - 1}{\eta}\right] \qquad (4A)$$

The actual discharge temperature based on the polytropic is calculated by equation 4B.

$$T_2 \approx T_1\left(\frac{P_2}{P_1}\right)^{\left(\frac{n-1}{n}\right)} \quad (4B)$$

where η and η_P are the isentropic (or adiabatic) and polytropic efficiency, respectively, P_1 suction pressure, P_2 discharge pressure, T_1 and T_2 arethe suction and discharge temperatures, respectively, q is gas volume flow rate at standard condition of P_S and T_S, Z_a average gas compressibility factor, k heat capacity ratio, R the gas constant, and n is the polytropic path exponent. Equations 1 and 2 are equally correct theoretically. The practical choice depends on the available data, although it is somewhat arbitrary. The power calculation should be made per stage of compression and then summed for all stages connected to a single driver. For general planning purposes the graphical solutions shown in reference [2] produce results comparable to these equations.

Equation of State (EOS)

The heart of any commercial process flow simulation software is an equation of state. Due to their simplicity and relative accuracy, normally a cubic EOS such as Soave Redlich-Kwong (SRK) [3] or Peng-Robinson [4] is used. These equations are used to calculate phase behavior, enthalpy, and entropy. With proper binary interaction coefficients, the process simulation results of these two equations are practically the same. Therefore, only the SRK was used in this work.

Step-by-Step Computer Solution

For known gas rate, pressure (P_1), temperature (T_1), and composition at the inlet condition and discharge pressure (P_2), computation of compressor power requirement is based on an EOS using a computer and involves two steps:

1. Determination of the ideal or isentropic (reversible and adiabatic) enthalpy change of the compression process. The ideal work requirement is obtained by multiplying mass rate by the isentropic enthalpy change.
2. Adjustment of the ideal work requirement for compressor efficiency.
   The step-by-step calculation based an EOS is outlined below.

   a. Assume steady state, i.e.   and the feed composition remain unchanged.
   b. Assume isentropic process, i.e. adiabatic and reversible
   c. Calculate enthalpy $h_1=f(P_1, T_1, \text{and composition})$ and suction entropy $s_1=f(P_1, T_1, \text{and composition})$ at the suction condition by EOS
   d. For the isentropic process $s_2^*(P_2, T_2^*, composition) = s_1(P_1, T_1, composition)$. Note the * represents ideal value.
   e. Calculate the ideal enthalpy (h_2^*) at outlet condition for known *composition*, P_2 and s_2^*.
   f. The ideal work is $W^* = (\dot{m})(h_2^* - h_1)$
   g. The actual work is the ideal work divided by efficiency or $W = \frac{W^*}{\eta}$
   h. The actual enthalpy at the outlet condition is calculated by $h_2 = \frac{W}{\dot{m}} + h_1$
   i. The actual outlet temperature is calculated by EOS for known h_2, P_2, and composition.

The efficiency of the compressor, and hence, the compression process obviously depends on the method used to evaluate the work requirement. The isentropic efficiency is in the range of 0.70 to 0.90.

If the compressor head curve and efficiency curve are provided by the manufacturer, the head is determined from the actual gas volume rate at the inlet condition. Second, from the head, the actual work, discharge pressure and finally the discharge temperature are calculated.

Case Study

The gas mixture with the composition shown in Table1 at 105 °F (40.6 °C) and 115 Psia (793 kPa) is compressed using a single-stage centrifugal compressor with the polytropic head and efficiency curves shown in Figures 1 and 2 at a speed of 7992 rpm. The total feed gas volumetric flow rate was 101 MMSCFD (2.86×10^6 Sm^3/d).

Table 1. Feed gas analysis

Component	Mole %
C_1	83.099
C_2H_6	6.925
C_3H_8	4.946
iC_4	1.484
nC_4	0.989
nC_5	0.495
iC_5	0.495
C_6	0.198
Benzene	0.040
C_7	0.148
Toluene	0.010
C_8	0.099
Ethylbenzene	0.005
o-Xylene	0.005
C_9	0.050
C_{10}	0.030
H_2O	0.983
Sum	100.0

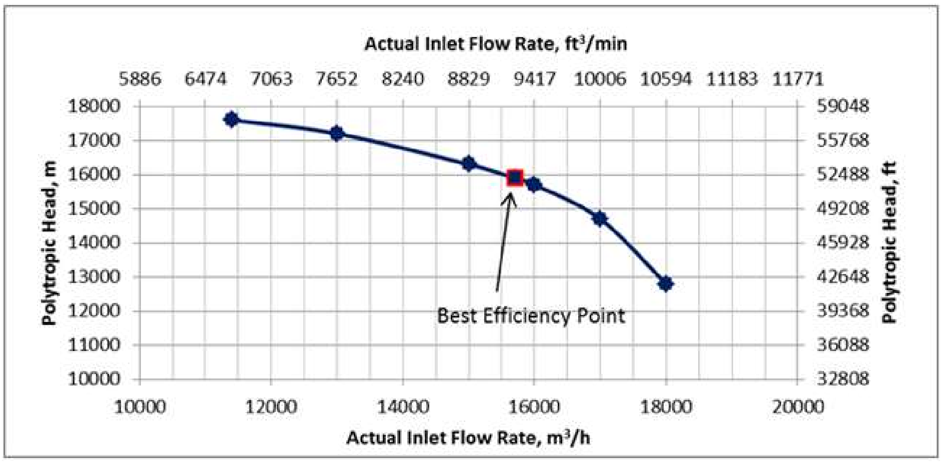

Figure 1. Compressor polytropic head and best efficiency point

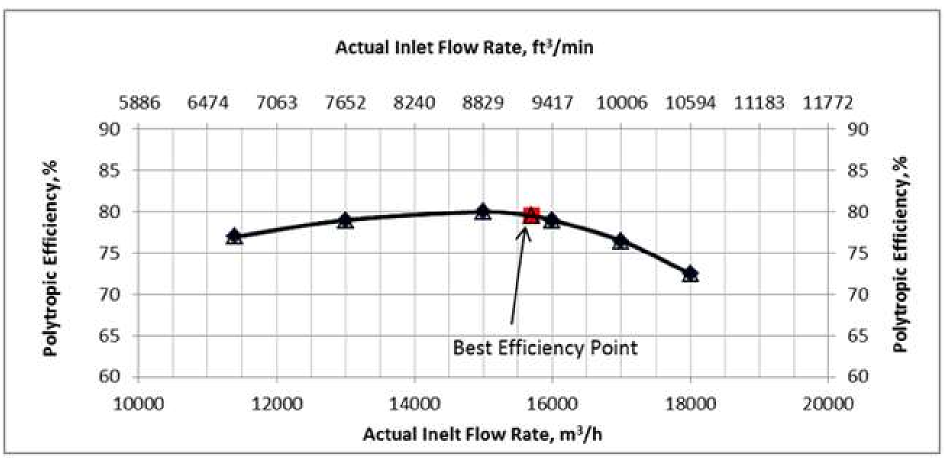

Figure 2. Compressor polytropic efficiency

Results and Discussions

SRK (Rigorous Method): The feed composition, temperature, pressure, volumetric flow rate at standard condition along with the compressor polytropic head and efficiency curves data were entered into the ProMax software [5] to perform the rigorous calculations based on the SRK EOS. The program calculated polytropic and isentropic efficiencies, heads, compression ratio (discharge pressure), discharge temperature and power. For the actual gas flow rate at the inlet condition, the polytropic efficiency is close to the compressor *best efficiency point* (BEP). The program also calculated the gas relative density, heat capacity ratio (k), and polytropic exponent (n). These calculated results are presented in the SRK columns of Table 2 (bold numbers with white background).

Table 2. Summary of the rigorous and shortcut calculated results

August 2013
July 2013
June 2013
May 2013
April 2013
March 2013
February 2013
January 2013
December 2012
November 2012
October 2012
September 2012
August 2012
July 2012
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May 2009
April 2009
March 2009
February 2009
January 2009

System of Units	Field (FPS)			SI		
Method of Calculations	SRK	Short-1	Short-2	SRK	Short-1	Short-2
Suction Temperature, °F (°C)	105	105	105	40.6	40.6	40.6
Suction Pressure, Psia (kPa)	115	115	115	793	793	793
Suction Volume Rate, MMSCFD (10^6 Sm^3/d)	100.99	100.99	100.99	2.8598	2.8598	2.8598
Suction Actual Volume Rate, ft^3/min (m^3/h)	9,544	9,544	9,544	16,215	16,215	16,215
Isentropic (Adiabatic) Efficiency, η, %	76.60	76.60	**76.20**	76.60	76.60	**76.20**
Gas Relative Density	**0.708**	0.708	0.708	**0.708**	0.708	0.708
Polytropic Efficiency, η_P, %	**78.57**	78.57	78.57	**78.57**	78.57	78.57
Compression Ratio, P_2/P_1	**2.93**	2.93	2.93	**2.93**	2.93	2.93
Discharge Pressure, Psia (kPa)	**337**	337	337	**2324**	2324	2324
Heat Capacity (C_P/C_V) Ratio, k	**1.224**	1.224	**1.251**	**1.224**	1.224	**1.251**
Polytropic Exponent, n	**1.304**	1.304	**1.343**	**1.304**	1.304	**1.343**
Discharge Temperature, °F (°C)	**266**	**265.9**	**283.5**	**130.0**	**129.9**	**139.7**
Adiabatic Head, ft (m)	**49,680**	**49,578**	**50,067**	**15,142**	**15,111**	**15,260**
Polytropic Head, ft (m)	**50,968**	**50,983**	**51,624**	**15,535**	**15,540**	**15,735**
Power, hp (kW)	**7,451**	**7,444**	**7,557**	**5,560**	**5,555**	**5,639**

The bold numbers with white background are the calculated values

Short-1 (Shortcut Method): In this method, we used equations 2 through 4 to calculate the polytropic and isentropic heads, the discharge temperature and power. We used the ProMax calculated polytropic and isentropic efficiencies, compression ratio (P_2/P_1), heat capacity ratio (k) and polytropic exponent (n) to calculate head, power, and the discharge temperature. The results are presented in the *short-1* columns of Table 2. Note the *short-1* results (discharge temperature, adiabatic and polytropic heads and power) are very close to the SRK values. The calculated actual discharge temperature by equation 4A (isentropic path: 265.3˚F=129.6˚C) was slightly lower than by equation 4B (polytropic path: 265.9 ˚F=129.9 ˚C).

Short-2 (Shortcut Method): Similar to *short-1* method, we used equations 2 through 4 to calculate the polytropic and isentropic heads, the actual discharge temperature and power. We used only the ProMax calculated values of polytropic efficiency (η_P), compression ratio (P_2/P_1), and relative density (γ). The heat capacity ratio (k) was estimated by equation 5:

$$k = 1.3 - 0.31(\gamma - 0.55) \qquad (5)$$

The polytropic exponent (n) was estimated by equation 6.

$$\left(\frac{n-1}{n}\right) \approx \left(\frac{k-1}{(k)(\eta_P)}\right) \quad or \quad n \approx \frac{(k)(\eta_P)}{k-1} \qquad (6)$$

The isentropic (adiabatic) efficiency () was estimated by equation 7.

$$\mu \approx \frac{\left(\left(\frac{P_2}{P_1}\right)^{\left(\frac{k-1}{k}\right)} - 1\right)}{\left(\left(\frac{P_2}{P_1}\right)^{\left(\frac{n-1}{n}\right)} - 1\right)} \qquad (7)$$

The results for this method are presented in the *short-2* columns of Table 2. The calculated discharge temperature by equation 4A (isentropic path) was exactly the same as by equation 4B (polytropic). Note the *short-2* results (discharge temperature, adiabatic and polytropic heads and power) are deviated from the SRK values.

The results in Table 2 indicate that an increase of 2.2% in k (from 1.224 to 1.251) results in power increase of 1.42%. The polytropic exponent (n) increased by 3% and isentropic efficiency (μ) decreased by 0.5 %. The difference in the actual discharge temperatures of the SRK and short-2 values is 17.5 ˚F (9.7˚C).

With the exception of actual discharge temperature, these differences between the SRK and short-2 methods results for facilities calculations and planning purposes are negligible. Note that the accuracy of the shortcut method is dependent on the values of k and n. In *Short-1* method in which we used the k and n values from the SRK method the results were identical to those of SRK method.

To learn more about similar cases and how to minimize operational problems, we suggest attending the John M. Campbell courses; G4 (Gas Conditioning and Processing), and G5 (Gas Conditioning and Processing-Special).

John M. Campbell Consulting (JMCC) offers consulting expertise on this subject and many others. For more information about the services JMCC provides, visit our website at www.jmcampbellconsulting.com, or email your consulting needs to consulting@jmcampbell.com.

By Dr. Mahmood Moshfeghian

Reference:

1. Maddox, R. N. and L. L. Lilly, "Gas conditioning and processing, Volume 3: Advanced Techniques and Applications," John M. Campbell and Company, 2nd Ed., Norman, Oklahoma, USA, 1990.
2. Campbell, J. M., "Gas Conditioning and Processing, Vol. 2, the Equipment Modules, 8th Ed., Campbell Petroleum Series, Norman, Oklahoma, 2001
3. Soave, G., *Chem. Eng. Sci.*, Vol. 27, pp. 1197-1203, 1972.
4. Peng, D. Y., and Robinson, D. B., *Ind. Eng. Chem. Fundam.*, Vol. 15, p. 59, 1976.

Topics

5. ProMax 3.2, Bryan Research and Engineering, Inc, Bryan, Texas, 2011.

Posted on November 1, 2011 at 6:30 am

36 comments

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Written by Dr. Mahmood Moshfeghian

DR. MAHMOOD MOSHFEGHIAN is a Senior Technical Advisor and Senior Instructor. He is the author of most Tips of the Month and develops technical software for PetroSkills. He has 40 years teaching experience in universities as well as for oil and gas industries. Dr. Moshfeghian joined JMC in 1990 as a part time consultant and then as full time instructor/consultant in 2005. Moshfeghian was Professor of Chemical Engineering at Shiraz University. Dr. Moshfeghian is a senior member of AIChE and has published more than 125 technical papers on thermodynamic properties and Process Engineering. Dr. Moshfeghian has presented invited papers in international conferences. He is a member of the Editorial Board for the International Journal of Oil, Gas, and Coal Technology and a member of the GPSA Technical Committee Group F. He holds B.S. (74), M.S. (75) and and PhD (78) degrees in Chemical Engineering, all from Oklahoma State University.

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36 responses to "Compressor Calculations: Rigorous Using Equation of State vs Shortcut Method"

1. *Antonio Davila* says:
   November 1, 2011 at 1:41 pm

   Compressor

2. *Joe Aiken* says:
   November 1, 2011 at 4:02 pm

   Could you please advise whether the values of 'k' used in the two methods were based on the Cv=Cp-R (Ideal Gas) relationship or 'real' values of Cv calculated directly from the EoS? This can have a significant impact on the results, e.g. incorporating 'real' values of 'k' (from HYSYS) into the API equations for relief valve sizing can over-estimate the capacity of a given orifice.

   - *Mahmood Moshfeghian* says:
     November 7, 2011 at 7:53 pm

     Joe,

     k=Cp/Cv is based on the ideal gas heat capacity ratio.

3. *RAHUL MUKHERJEE* says:
   November 1, 2011 at 11:24 pm

   Dear Dr. Mahmood,

   Thanks for this article.

   I would just like to know two things.

   1. What is the basis of eqn 5? Did you make a linear best fit in excel in between the dependent variable k and independent variable y and arrived at the eqn.?

   2. When heat capacity ratio (k) is meant, is it Cp/Cv or Cp/(Cp-R) (i.e., an ideal gas heat capacity ratio)?

   I would be greatful, if you could provide me the answers.

   Thanks,
   Rahul Mukherjee
   Rahul.Mukherjee@veco.com

   - *Mahmood Moshfeghian* says:
     November 7, 2011 at 7:46 pm

     Rahul,

     1. Equation 5 is purely empirical, based on typical natural gases that contain no substantial quantities of non-hydrocarbons and whose relative density does not exceed one.

     2. k=Cp/Cv is the ideal gas heat capacity ratio.

     - *Henry Lafford* says:
       December 5, 2011 at 4:27 pm

       Dear Dr. Mahmood,
       As per your response above, k is the ideal specific heat ratio based on Cv=Cp-R as the article demonstrates simple hand calcs without a process simulator for EOS calcs. If you were carrying out calculations on a non ideal gas (e.g. Z = 0.8), and could obtain actual specific heat ratio from a

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process simulator, would this be the correct approach (or would you still have to use ideal specific heat ratio)?

4. *Rasheed Abdi* says:
   December 14, 2011 at 3:49 pm

   Dr Mahmood

   I just want to calculate efficiency and head for air compressor having the several points of suction pressure vs flowrate in m3/h. Please help..

   Thank you

5. *Olawale Oguntade* says:
   January 1, 2012 at 8:28 pm

   Please Sir,how do i find d expression for entropy for a soave-redlich kwong equation of state ?

6. *Reza* says:
   June 21, 2012 at 6:08 am

   Dear Mahmood:
   One important question in my mind. How can one calculate discharge temperature in oil injected compressor in Hysys or any other process software?

7. *Alireza Dehghan* says:
   July 16, 2012 at 10:47 am

   Hello Dr. Moshfeghian,

   I have written a procedure for measurement flow of a CNG compressor in refueling station. Is it possible for me to send the procedure for you to check if that is correct or not?

   Thank you

8. ***insoles for plantar fasciitis*** says:
   February 17, 2014 at 7:59 am

   Before you paint ceiling and walls, follow the 9 feet
   guideline. Virtually all children go through a period in which they appear to be knock-kneed when strolling.
   Include sophistication to your place with
   a couple of accessories to the door is a smart and easy way.

9. *Reza Azin* says:
   March 27, 2014 at 1:01 pm

   Interesting Material. My question is about the change in calculations when applied to a stream of Acid Gas containing CO2/H2S with trace of Hydrocarbons?
   How about the case with Flue gas compression?

10. ***maher*** says:
    July 21, 2014 at 10:23 am

    ı want to choose a compressor for a Project
    ı have tow things
    for EX:
    Room Name: WELDING ROOM
    Room Area: 79 m2
    Plumbing: Service sink (hot and cold water), (2) compressed air drops 0-1034kPa each, 345 kPa minimum to down flow station, 620-1034 kPa to plasma cutter.
    and there is another things but like that

    can help me Dr for knowing the Flow.Velocity for this compressor
    thx

11. *Helmuth* says:
    November 11, 2014 at 11:30 am

    Thank you very much!

12. ***wesley*** says:
    November 12, 2014 at 4:20 am

    Hi Doc,thanks for the nice educating post.My question is;Are equations 2A,2B,3A,3B,4A and 4B applicable to real gases?

13. *Venkat Subramanian* says:
    March 23, 2015 at 3:30 am

    Dr. Thanks for the nice writeup. How do we estimate the k value and gamma value when we inject known volumetric flows of wash oil or water to cracked gas compressor stages to mitigate fouling due to polymerization?. This has been the challenge. Please help.
    Thanks
    Venkat

14. *Mr J Adamson* says:
    April 7, 2015 at 10:48 am

    hello

    i wonder if anyone can help me , i need to find the adiabatic efficiency of a compressor we are prototyping. i am by no means a mathematician and all these equations are really confusing me. if someone could explain to me what all the letters stood for it would be a great help

    many thanks

15. ***Dr. Mahmood Moshfeghian*** says:
    April 8, 2015 at 9:34 am

    Adamson:
    Method 1:

1. Knowing gas molecular weight (MW) estimate, gas relative density or Specific Gravity by SG=MW/29
2. Plug in SG (the Greek letter gamma) into equation 5 to estimate k (ratio of specific heats at the ideal gas conditions).
3. Knowing compressor polytropic efficiency provided by the vendor calculate n by equation 6 (the 2nd one on the right hand side. n= polytropic exponent.
4. Use equation 7 to estimate the adiabatic efficiency (the Greek letter, mu). P1 and P2 are the suction and discharge pressures, respectively.

Note: All T's and P's are absolute value

If the polytropic efficiency is not available, one can use use the following procedure for a working compressor:
Method 2:

1. Measure suction pressure (P1), suction temperature (T1), and discharge pressure (P2), discharge temperature (T2).
2. Calculate compression ratio = R = P2/P1
3. Raise compression ratio to power of (k-1)/k or CR=(P2/P1)^[(k-1)/k]
4. Estimate adiabatic efficiency = T1(CR-1)/(T2-T1). This rearrangement of equation 4A.

Note: All T's and P's are absolute value

Method 3:

1. Measure suction pressure (P1), suction temperature (T1), and discharge pressure (P2), discharge temperature (T2).
2. Use a Pressure-Enthalpy-diagram for your gas or a computer program to calculate: Suction enthalpy (H1) at P1 and T1, discharge enthalpy H2 at P2 and T2, discharge isentropic enthalpy H2ise.
3. Estimate adiabatic (isentropic) efficiency by:

Adiabatic efficiency = (H2ise – H1)/(H2-H1)

The detail of this topic is covered in our G4 (Gas Processing and Conditioning) course.
I hope this helps.

16. ***Corazon*** says:
    August 15, 2015 at 10:55 pm

    This keeps players glued to their monitors
    to make sure they don't miss a thing. So decide if you are irritated, or happy with the color and sound of the poker room to sign in. Those cards drop down and become part of the hand on the second line. Of course there is some sumptuous finger food
    to take care of your appetite.

17. *Anjum Alvi* says:
    August 18, 2015 at 8:59 am

    Dear Sir,

    Can you please tell me any relation between Steam Enthalpy and RPM of a Steam Turbine. How they affect each other?

18. ***Elite Proxies*** says:
    December 4, 2015 at 8:22 am

    DreamProxies.com – least expensive top-notch private proxies with 50% low cost! Professional quality, Unrestricted proxies, Very speed along with Cheapest price ranges – simply $0.25 for every proxy! Finest individual proxies just from DreamProxies.com

19. ***Jason Joecks*** says:
    December 24, 2015 at 10:57 am

    Merely wanna tell that this is very useful, Thanks for taking your time to write this.

20. ***Leslie Banaszak*** says:
    December 27, 2015 at 1:10 pm

    I gotta bookmark this site it seems very helpful very useful

21. *Idowu Oduniyi* says:
    March 13, 2016 at 10:14 am

    Hello sir,
    Can the polytropic efficiency of compression be greater than unity,when n is less than k (i.e 1<n<k).
    since using the polytropic efficience [(k-1)/k]/[(n-1)/n] will be greater than 1.

22. ***Cheap Private Proxies*** says:
    June 4, 2016 at 4:50 am

    DreamProxies.com — least expensive top-notch private proxies with 50% low cost! Elite quality, Limitless proxies, Very speed and Cheapest prices : only $0.25 for each proxy! Best non-public proxies just on DreamProxies.com

23. ***Olivia*** says:
    August 26, 2016 at 1:27 pm

    Guys who of you play Pokemon GO? Incredible game, finally Lickitung has been caught
    using pokebusterbot. With this bot you can catch pokemons on autopilot!

24. *Morteza* says:
    November 25, 2016 at 1:31 am

    how should calculate polytropic efficiency of single stage compressor with suction and discharge pressure and temperature and gas composition

    - *Panos* says:
      January 1, 2017 at 4:44 pm

      https://www.degruyter.com/view/j/tjj.ahead-of-print/tjj-2016-0029/tjj-2016-0029.xml

      For low pressures and relatively high temperatures, you can also use the ideal gas law instead of cubic equations of state ..

25. *Jayant D Divey* says:
    April 4, 2017 at 7:50 am

Where is the use of compressibility factor while calculating discharge temp T2 in adiabatic compression for non-ideal gas?

- *Jayant D Divey* says:
  April 10, 2017 at 12:37 am

  Dr. Mahmood,

  I had put up a query about how to use compressibility factor for calculating adiabatic discharge temperature? Whenever z defers significantly from 1 for example for ethylene at pressure of 100 bar, how to use Z for calculating adiabatic discharge temperature. Request help.

26. *henysman* says:
    April 8, 2017 at 10:32 am

    What is the formula to calculate compressor number? if there is given compression rartio or somethimg like that.

27. ***Jeff*** says:
    April 29, 2017 at 1:37 pm

    I am looking for a vendor that publishes isentropic compressor efficiencies as a sales point…akin to COP for a refrigerator. Can you provide vendor that does such? Nice web page, thanks.

    - *Jayant D Divey* says:
      May 2, 2017 at 1:03 am

      GE and Burckhardt Compression are likely vendors to define isentropic efficiency.

28. *Greg Janse van Vuuren* says:
    May 17, 2017 at 1:31 pm

    These “Tip of the month” pages are really insightful.

    Would these equation work for an oil injected twin rotary screw compressor?

29. *nonso uwa* says:
    May 18, 2017 at 10:11 am

    help solve this:

    Calculate the power required to overcome the internal losses in an electrically driven turbo compressor operating under the following conditions: Suction volume : 1140 m^2/min Temperature : 27 ˚C Pressure : 0.85bar (abs)
    Deliver temperature : 104 ˚C Pressure : 6.5bar (abs) Motor load : 5850 w
    Work done = n/(n-1)(P_2 V_2-P_1 V_1)

30. *Umar* says:
    November 7, 2017 at 7:40 am

    Interesting forum