A chiller on the ground floor of an 8 story building is cooled with 400 gpm of water. This water must be pumped to a cooling tower located on the top of the building (top = 80ft). A Goulds 3196 3x4-13 pump with an 11-inch impeller is selected for this application. Unfortunately, the design point, selected at 600gpm and accounting for frictional losses in addition to the 80 ft of static head, is 600gpm and 120 ft of head. At 400gpm, the total developed head for the system is 97.8 feet of water. Assume the electric motor has 92% efficiency at full load.

a. What is the pump efficiency and input power (kW) required at the design point?
b. A valve is placed in the discharge line to throttle the flow to the required rate of 400 gpm. What is the pump efficiency and input power (kW) required at this condition?
c. If the pump runs 80% of the time (8760 hrs/yr maximum) and electricity cost is $0.075/kWh, estimate the potential savings if an appropriate-sized pump were used.
Model: 3196  Size: 3X4-13  Group: MTi  60Hz  RPM: 1775  Stages: 1

Job/Inq.No.:  UNDEFINED
Purchaser:  UNDEFINED
End User:  UNDEFINED
Item/Equip.No.:  ITEM 001
Service:  UNDEFINED
Order No.:  UNDEFINED

Quotation No.: KW09-04-07 01  Date: 04/07/2009

Operating Conditions

- Liquid: Water
- Temp.: 70.0 deg F
- S.G./Visc.: 1.000/1.000 cp
- Flow: 600.0 gpm
- TDH: 120.0 ft
- NPSHa: UNDEFINED
- Solid size: UNDEFINED
- % Susp. Solids (by wtg): UNDEFINED
- Max. Solids Size: 0.6250 in

Pump Performance

- Published Efficiency: 73.0%
- Suction Specific Speed: 9,478 gpm(US) ft
- Rated Pump Efficiency: 73.0%
- Min. Hydraulic Flow: 142.2 gpm
- Rated Total Power: 25.2 hp
- Min. Thermal Flow: N/A
- Non-Overloading Power: 27.2 hp
- Imp. Dia. First 1 Stg(s): 11.0000 in
- NPSHr: 9.5 ft
- Shut off Head: 138.7 ft
- Vapor Press: UNDEFINED

Notes:
1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above.
2. Magnetic drive eddy current and viscous effect on power and efficiency is not included.
3. Elevated temperature effects on performance are not included.
4. Non Overloading power does not reflect v-belt/gear losses.
Model: 3196  Size: 3X4-13  Group: MTi  60Hz  RPM: 1775  Stages: 1

Job/Inq.No.:  
Purchaser: UNDEFINED  
End User:  
Item/Equip.No.: ITEM 001  
Service:  
Order No.:  

Operating Conditions

Liquid: Water  
Temp.: 70.0 deg F  
S.G./Visc.: 1.000/1.000 cp  
Flow: 600.0 gpm  
TDH: 120.0 ft  
NPSHa:  
Solid size:  
% Susp. Solids:  
Max. Solids Size: 0.6250 in

Pump Performance

Published Efficiency: 73.0 %  
Rated Pump Efficiency: 73.0 %  
Rated Total Power: 25.2 hp  
Non-Overloading Power: 27.2 hp  
Imp. Dia. First 1 Stg(s): 11.0000 in  
NPSHr: 9.5 ft  
Shut off Head: 138.7 ft  
Vapor Press:  

Liquid:

- Water

Temp.:

- 70.0 deg F

S.G./Visc.:

- 1.000/1.000 cp

Flow:

- 600.0 gpm

TDH:

- 120.0 ft

NPSHa:

-  

Solid size:

-  

% Susp. Solids:

-  

Max. Solids Size:

- 0.6250 in

Notes:

1. The Mechanical seal increased drag effect on power and efficiency is not included, unless the correction is shown in the appropriate field above.  
2. Magnetic drive eddy current on power and efficiency is not included.  
3. Elevated temperature effects on performance are not included.  
4. Non Overloading power does not reflect v-belt/gear losses.