13.17

Dana Back

The total head compability of a Centrifugal pump varies with the square of speed.

$$\frac{h_{a_1}}{h_{a_2}} = \left(\frac{N_1}{N_2}\right)^2$$

If the the speed of rotation of the impeller is cut in half the total head capability would be 1/4 of the original.

$$\frac{h_{a_1}}{h_{a_2}} = (6)^2 \qquad \frac{h_{a_1}}{h_{a_2}} = (3)^2$$

$$= 36 \qquad = 9$$

13.19

The capacity of a centrifugal pump varies directly with impeller diameter.

$$\frac{Q_1}{Q_2} = \frac{D_1}{D_2}$$

If the diameter of the impeller is reduced by 25% then the capacity will be reduced by 25%.

13.22

Centrifugal pump designation: $1\frac{1}{2} \times 3 - 6$

$1\frac{1}{2}$ = Discharge connection size (nominal inch)

3 = Suction connection size (nominal inch)

6 = Casing class (in inches) of largest impeller

13.23

Purpose

Specify suitable size pump to deliver 100 gal/min of water at total head of 300ft.

designation for pump that meets these requirements

2 x 3 - 8

13-25

Purpose

Determine expected capacity, Power required, efficiency and required NPSH.

Data and Variables

Centrifugal Pump — 2x3-10

8 in impeller

Head = 200 ft

Water at 70°F

$\gamma = 62.3\ lb/ft^3$

- Capacity required based from chart

$Q = 230\ gal/min = 0.512442\ ft^3/s$

- Power required based from chart

22.5 Hp

- efficiency

$P_A = h_a \gamma Q$

$= 200ft\ (62.3\ lb/ft^3)(0.512442\ ft^3/s)$

$= 6385.03\ \frac{ft\,lb}{s}$

$= 11.77\ Hp$

$\eta = \frac{11.77}{22.5}$

$= 0.523 \times 100$

$= 52.3\%$

- NPSH = 10ft

13.34

Purpose

list atleast one pump for each operating conditions.

a) 500gal/min, 80ft of head
— Reciprocating

b) 500gal/min, 800ft of head
— Reciprocating

c) 500gal/min, 80ft of head — Viscous adhesive
— Reciprocating

d) 80gal/min, 8000ft of head
— Reciprocating

e) 80gal/min, 800ft of head
— Rotary

f) 8000gal/min, 200ft of head
— Centrifugal

g) 8000gal/min, 40ft of head
— Mixed flow

h) 8000gal/min, 12ft of head
— axial flow