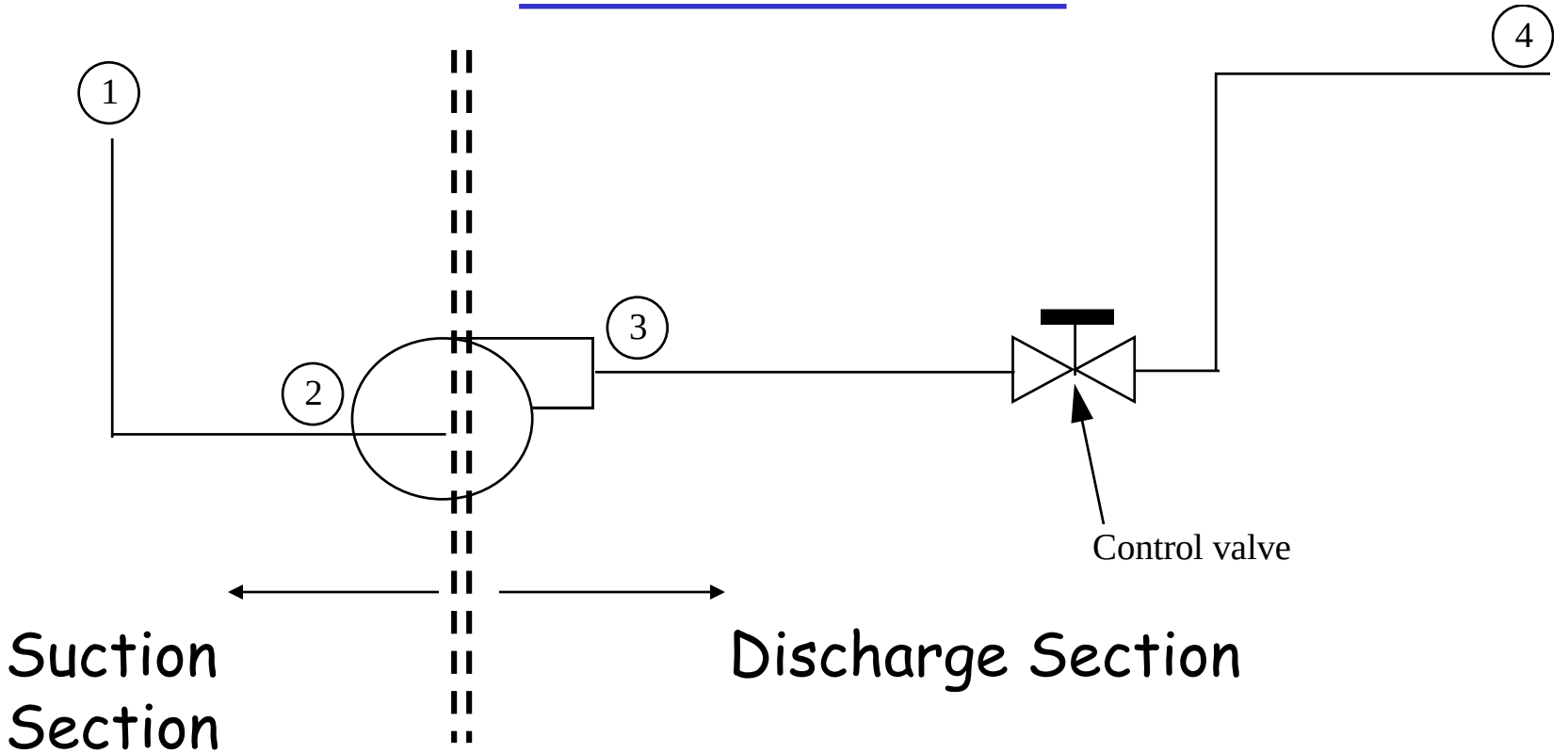
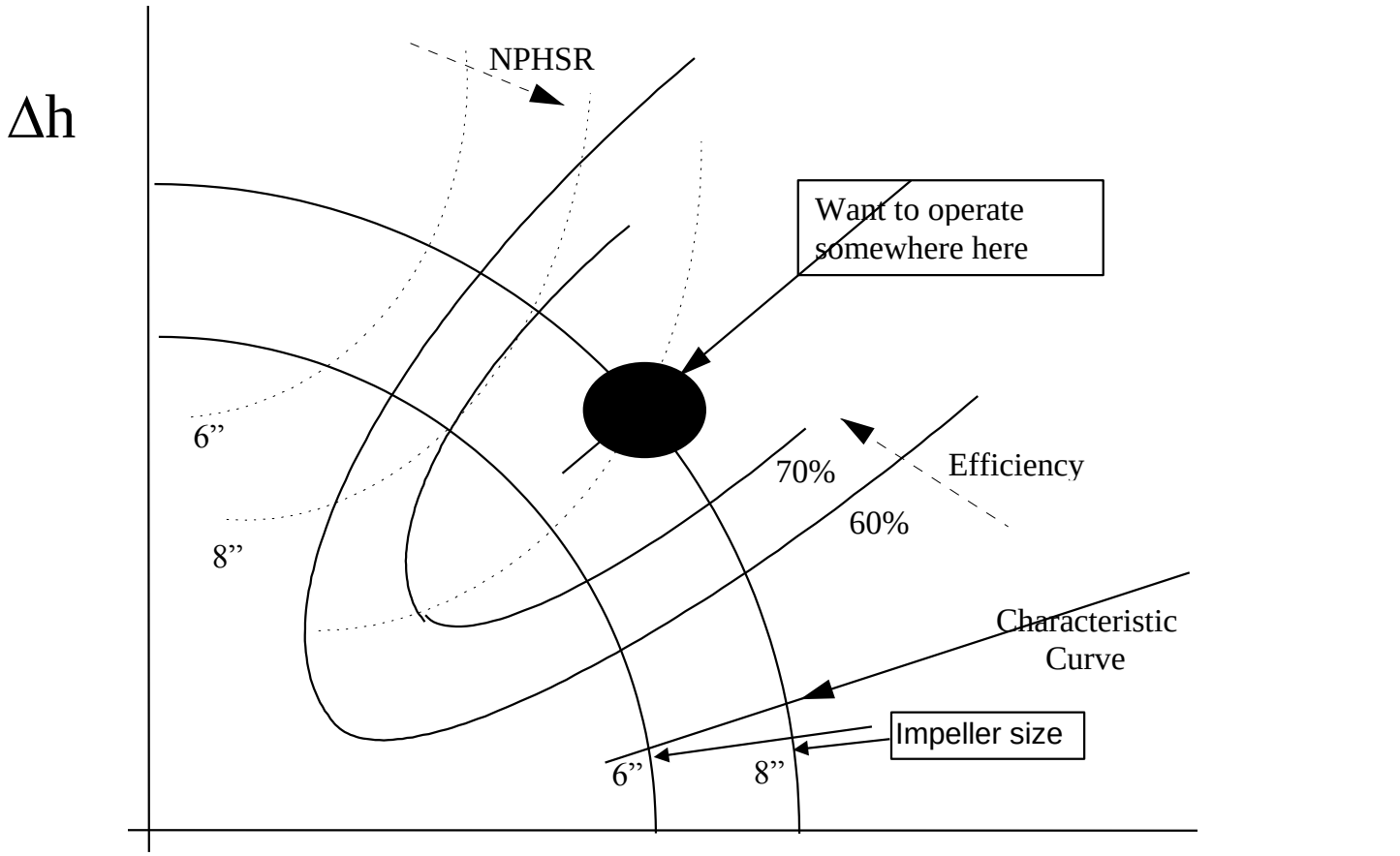
PUMP SELECTION

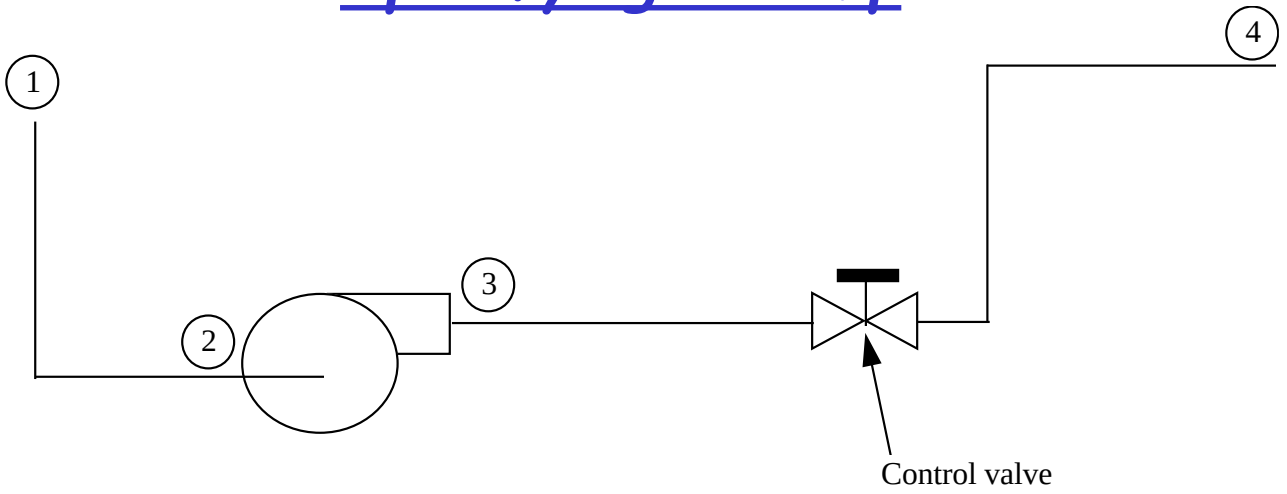


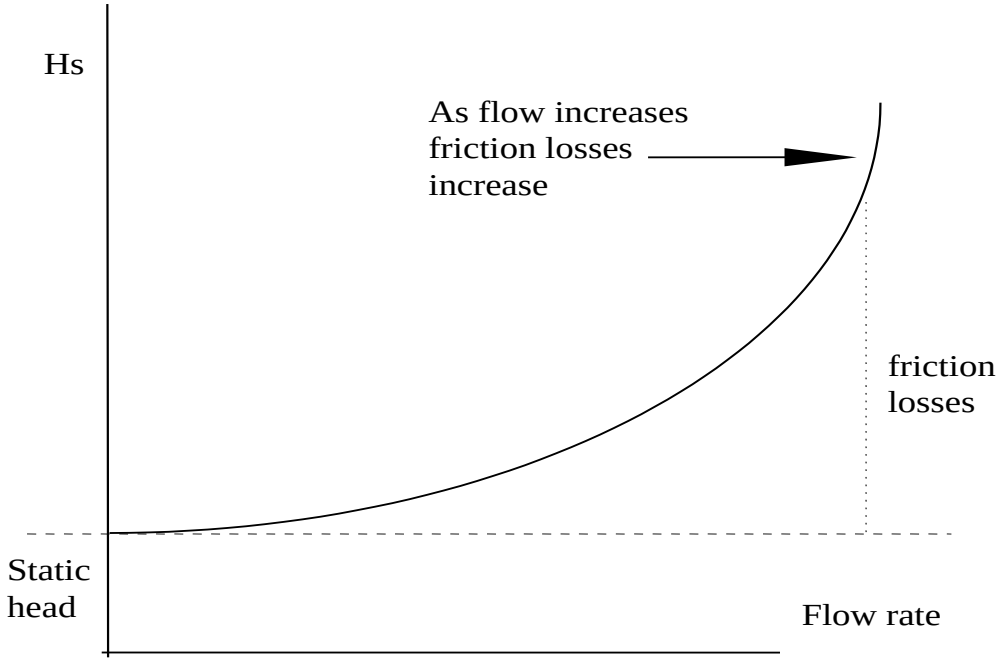
Fluid Flow - Pumps

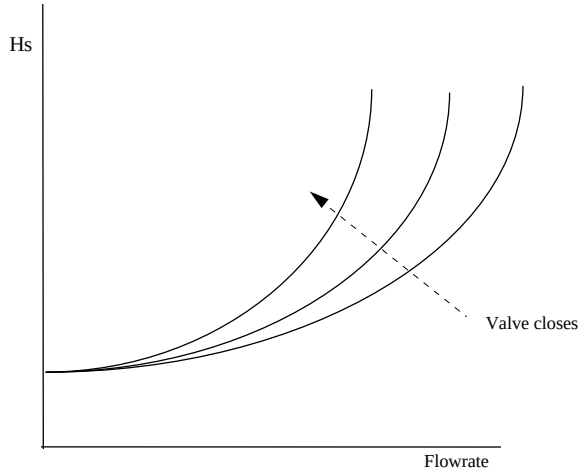
Centrifugal Pump Performance Curves



Specifying a Pump







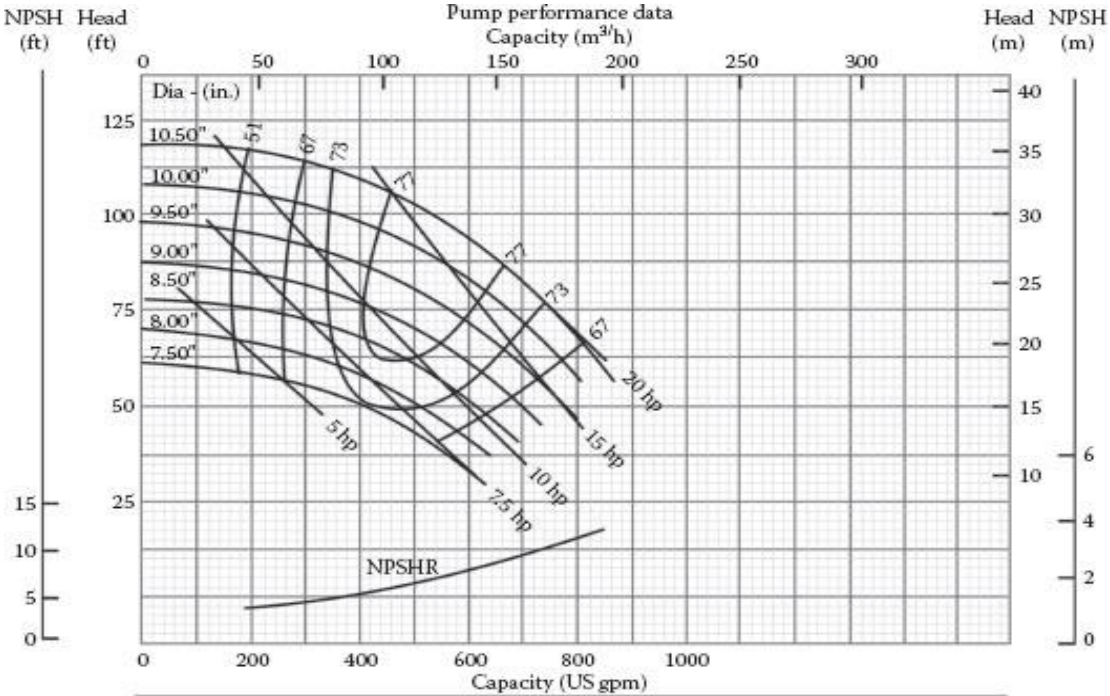
System curve

Assume that the system curve is given by

$\Delta p_{sys}(ft) = 25\ ft + 0.00025\ Q(gpm)^2$

and the available NPHSA is 4 ft or 10 ft.

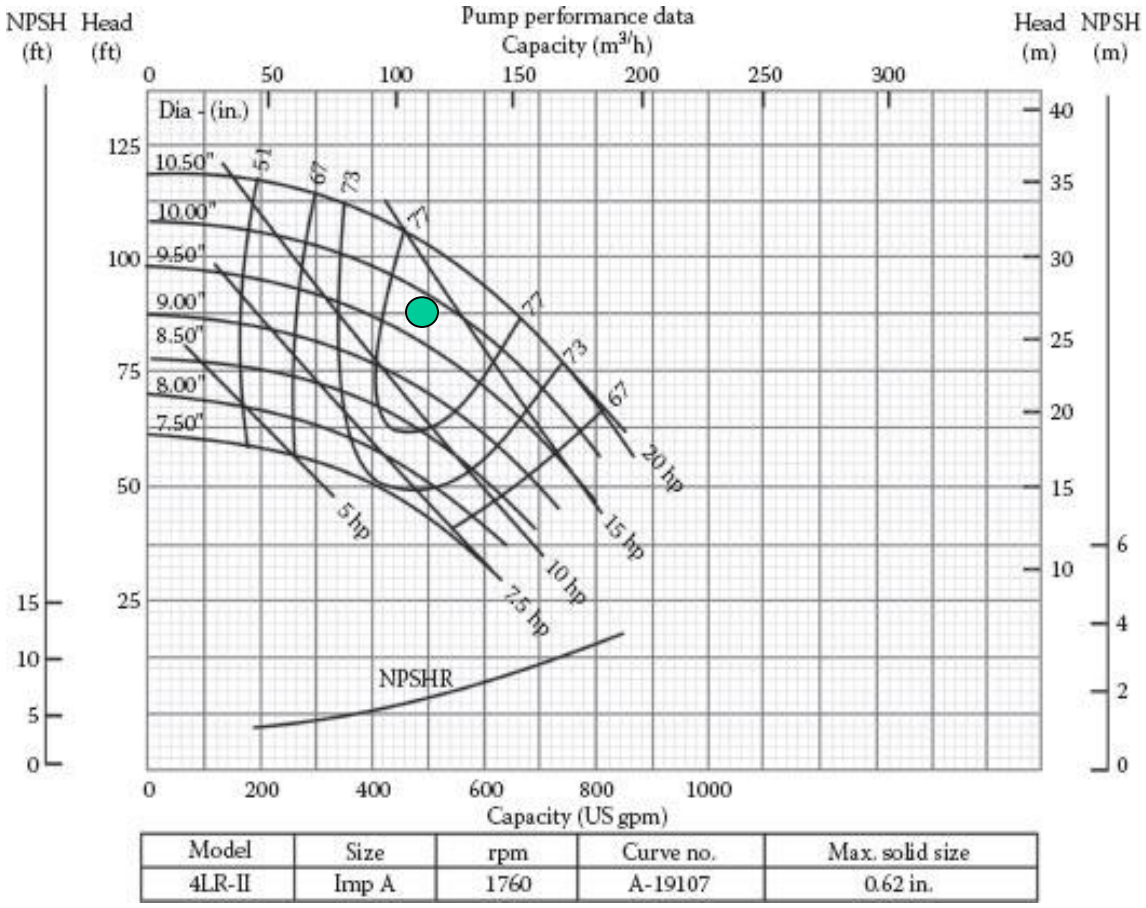
Is the following pump going to work for Q=500 gpm? If so, what is the impeller size BHP and efficiency?



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

System curve

$\Delta p_{sys}(ft) = 25\ ft + 0.00025\ Q(gpm)^2$; Available NPHSA is 4 ft. Q=500 gpm



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

For Q=500 gpm
$\Delta p_{sys}(ft) = 87.5$

NPHSR ~6

Pump will not work for NPHSA=4

Pump will work for NPHSA=10

Impeller D=10"
Efficiency=77%
BHP=15 HP

System curve

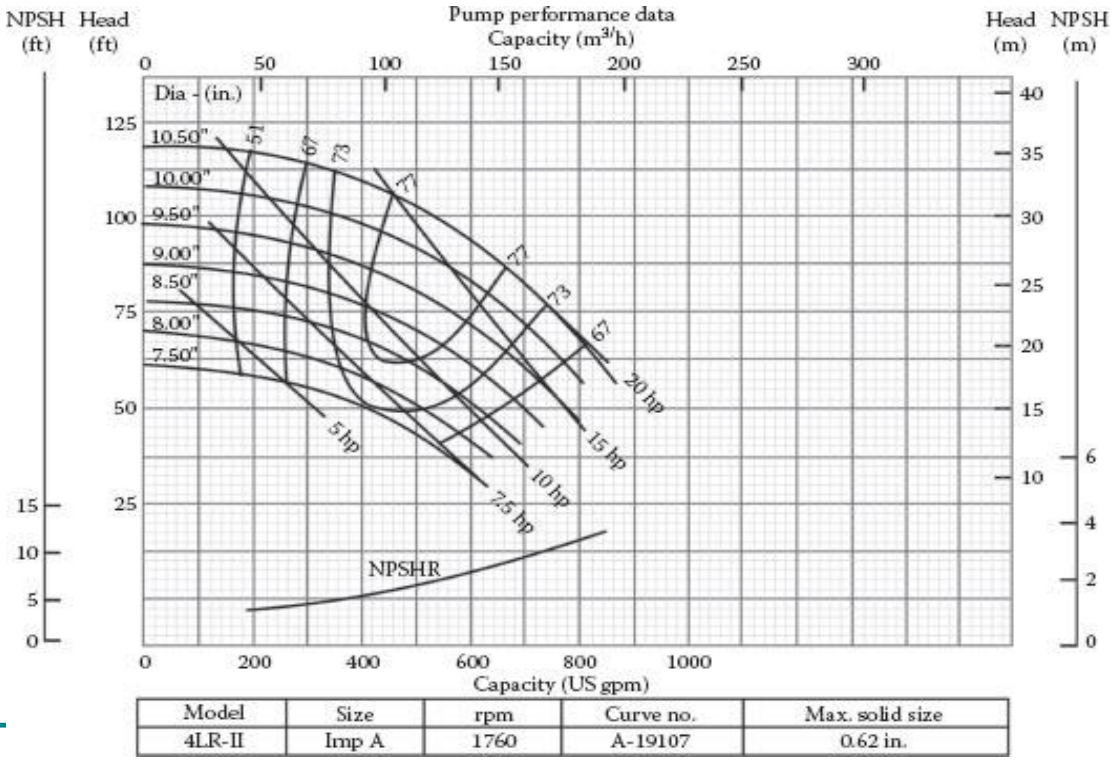
Assume that the system curve is given by

$\Delta p_{sys}(ft) = 25\ ft + 0.00025\ Q(gpm)^2$

and the available NPHSA is 10 ft. Assume a range from 475 to 525 gpm operability range.

Pick a valve size

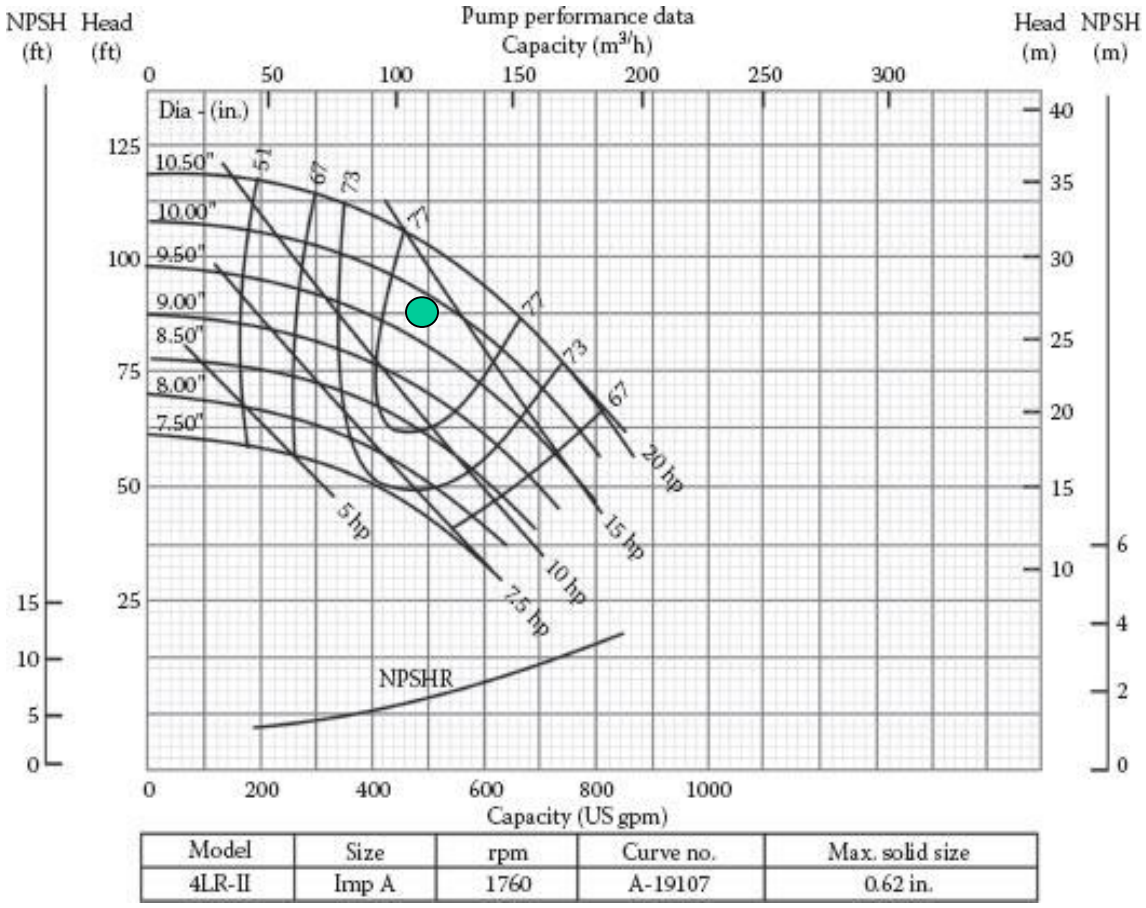
Size	Cv (300#)
1" DN025	18
1½" DN032	42
2" DN050	65
2½" DN065	102
3" DN080	160
4" DN100	270
6" DN150	565



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

System curve

$\Delta p_{sys}(ft) = 25\ ft + 0.0003\ Q(gpm)^2$; Available NPHSA is 4 ft. Q=500 gpm



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

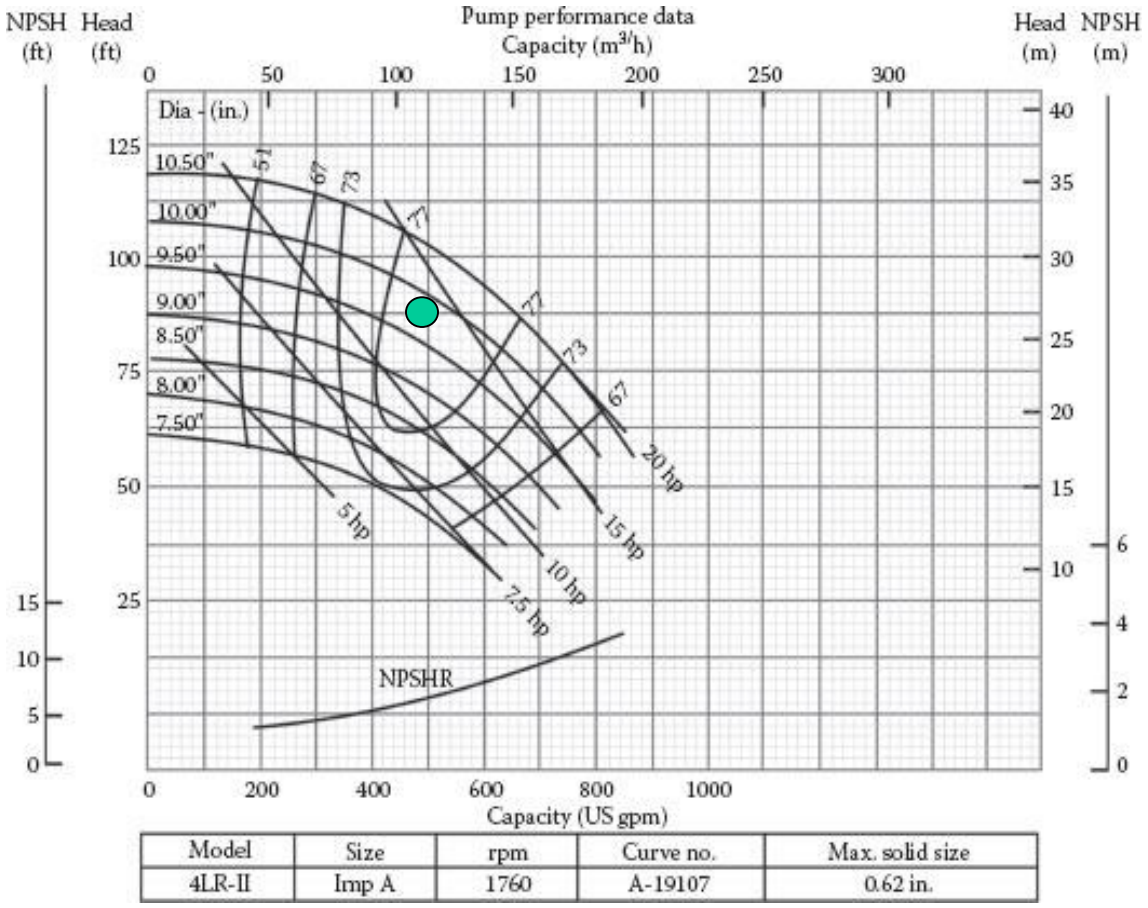
For Q=475 gpm
$\Delta p_{sys}(ft) = 81.4\ ft$
$\Delta p_{pump}(ft) \sim 95\ ft$
➔ $\Delta p_v(ft) \sim 13.6\ ft$

For Q=525 gpmt
$\Delta p_{sys}(ft) = 93.9\ ft$
$\Delta p_{pump}(ft) \sim 88\ ft$
➔ $\Delta p_v(ft) \sim -5.9\ ft$

Pump+valve will not work
Pick next Impeller Diameter= 10.5"

System curve

$\Delta p_{sys}(ft) = 25\ ft + 0.0003\ Q(gpm)^2$; Available NPHSA is 4 ft. Q=500 gpm



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

For new impeller:

For Q=475 gpm

$\Delta p_{sys}(ft) = 81.4\ ft$

$\Delta p_{pump}(ft) \sim 105\ ft$

➔ $\Delta p_v(ft) \sim 23.6\ ft$

For Q=525 gpm

$\Delta p_{sys}(ft) = 93.9\ ft$

$\Delta p_{pump}(ft) \sim 100\ ft$

➔ $\Delta p_v(ft) \sim 6.9\ ft$

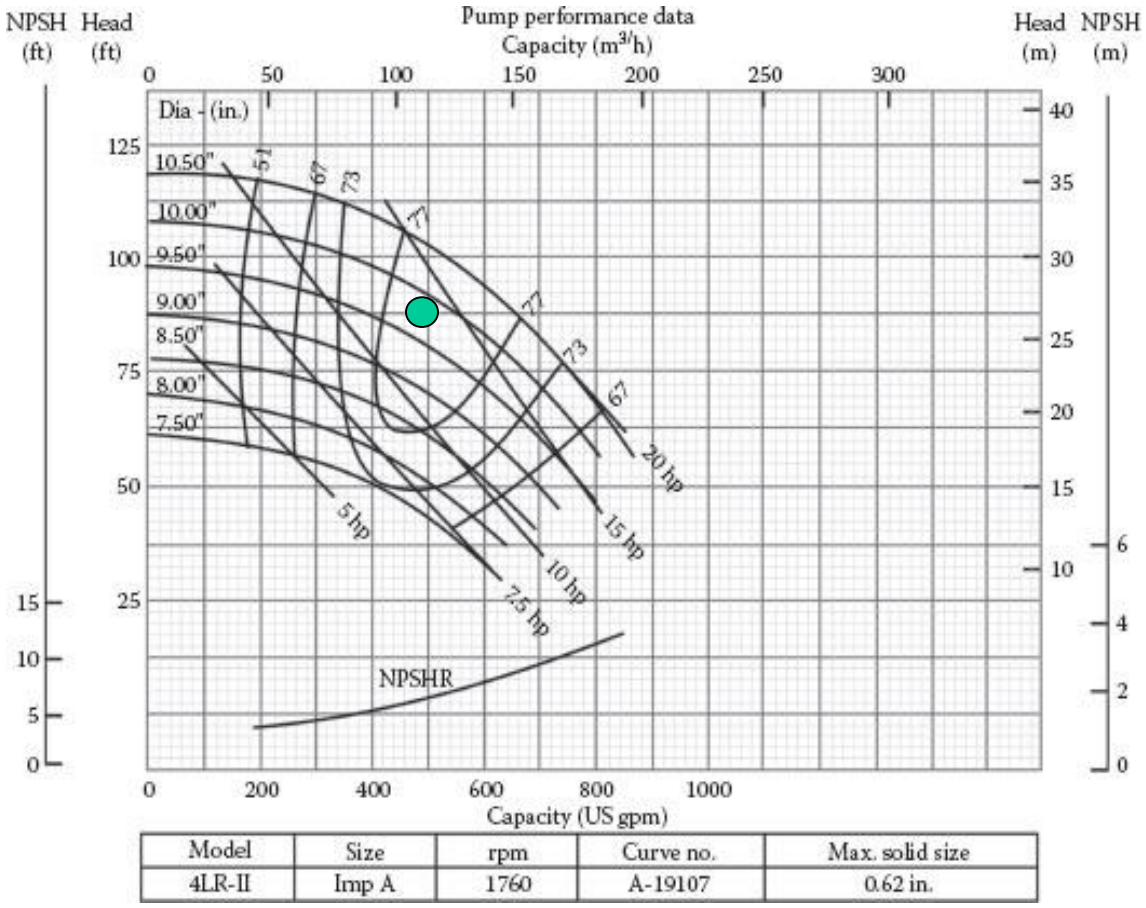
(33.2 ft= 14.7 psi)

Cvmax=0.85*525/Sqrt(3.06)

=255

System curve

$\Delta p_{sys}(ft) = 25\ ft + 0.0003\ Q(gpm)^2$; Available NPHSA is 4 ft. Q=500 gpm



Model	Size	rpm	Curve no.	Max. solid size
4LR-II	Imp A	1760	A-19107	0.62 in.

Size	Cv (300#)
1" DN025	18
1½" DN032	42
2" DN050	65
2½" DN065	102
3" DN080	160
4" DN100	270
6" DN150	565

Cvmax=255

Valve size= 4"

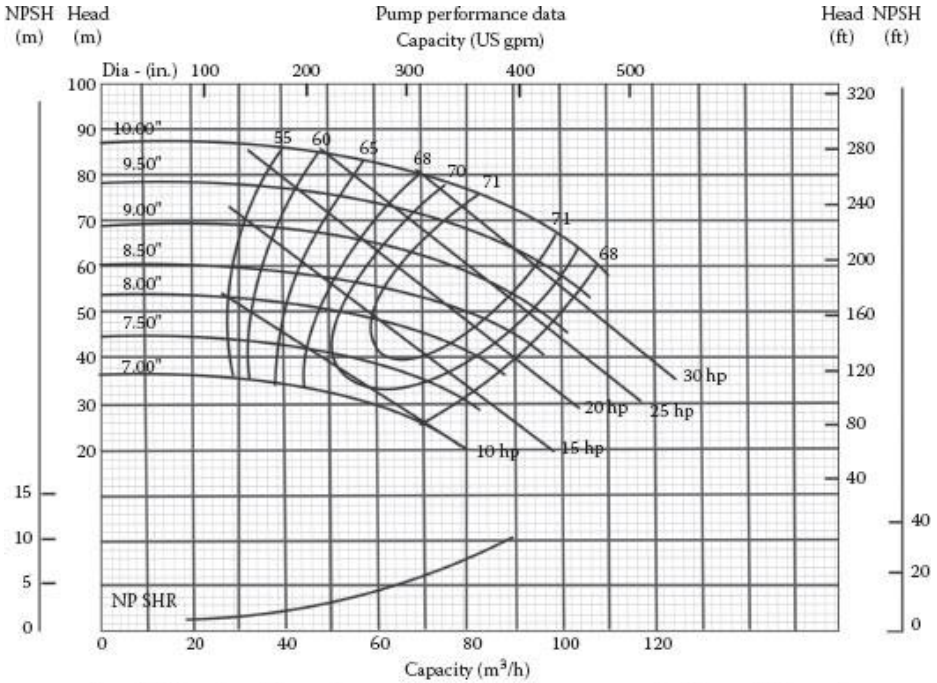
Linearity:
We will not cover this in test

System curve

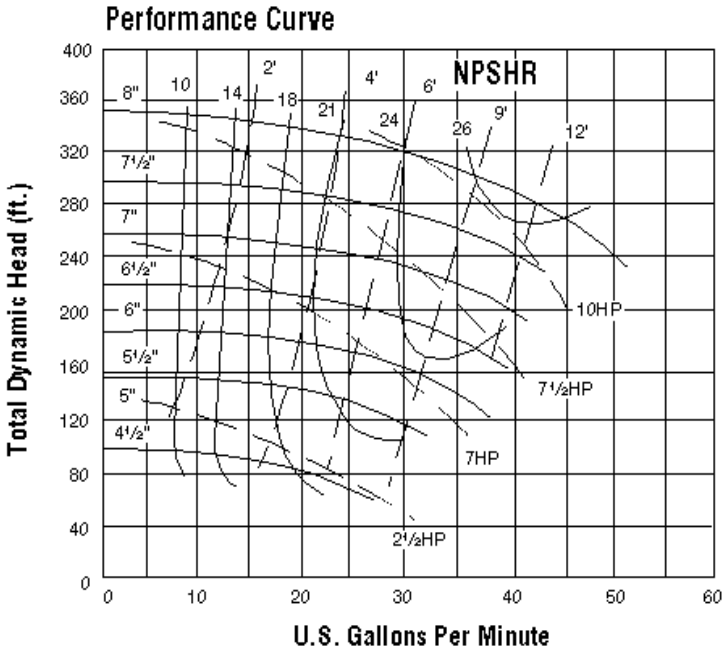
Assume that the system curve is given by

$\Delta p_{sys}(ft) = 10\ ft + 0.06\ Q(gpm)^2$ and the available NPHSA 10 ft.

For Q=30 gpm, Which pump is best?

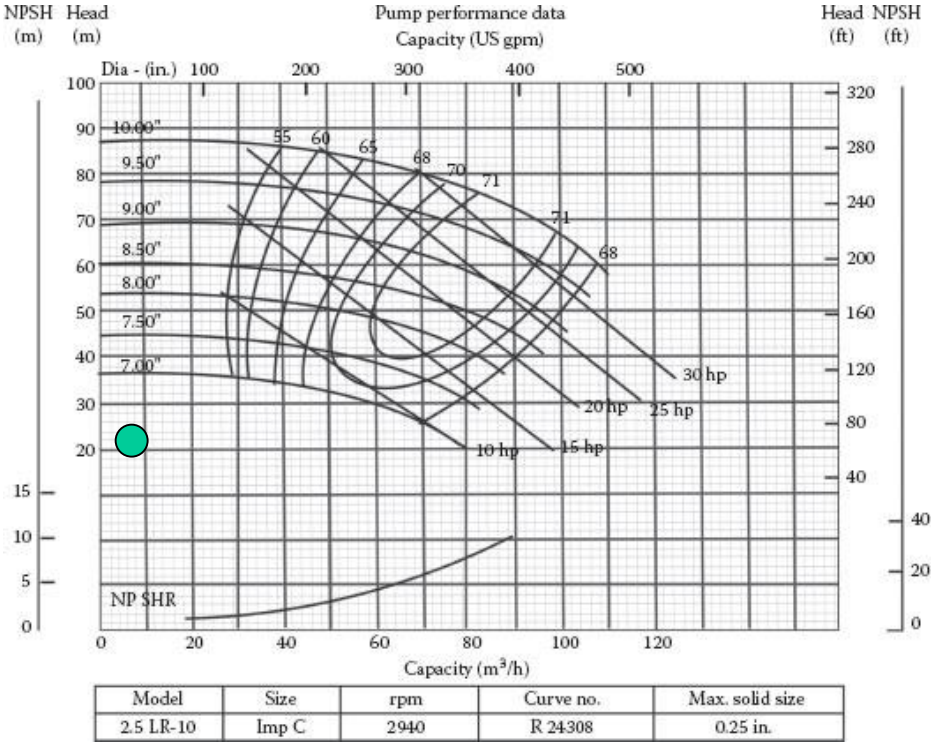


Model	Size	rpm	Curve no.	Max. solid size
2.5 LR-10	Imp C	2940	R 24308	0.25 in.

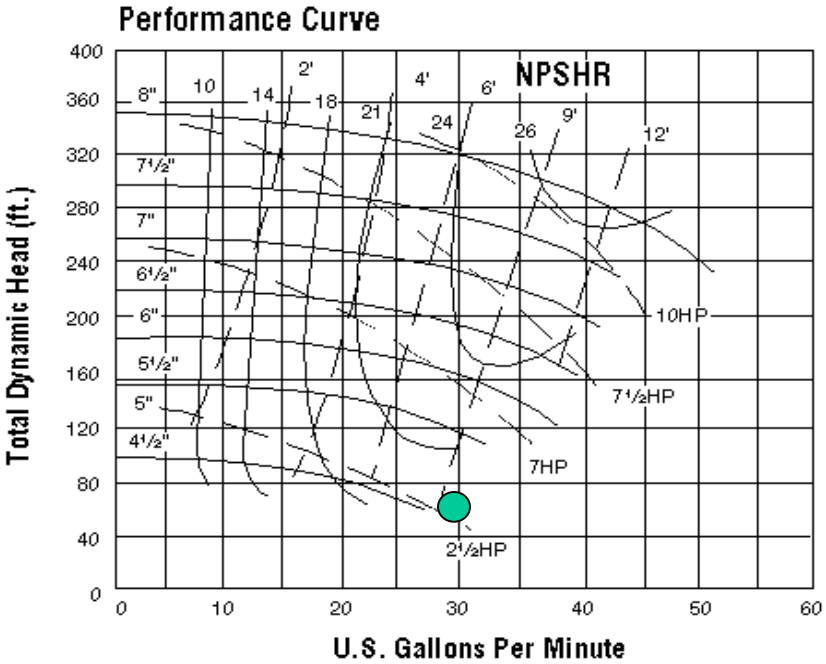


System curve

$\Delta p_{sys}(ft) = 10\ ft + 0.06\ Q(gpm)^2 = 64\ ft \quad Q = 30\ gpm$



Model	Size	rpm	Curve no.	Max. solid size
2.5 LR-10	Imp C	2940	R 24308	0.25 in.



Q in m3/h= 30 gpm*3.78 lt/m *10^{-3} m3/lt* 60 m/h=6.8 m3/h

$BHP_{pump\ 1}$=10 HP NPHSR~2 < NPHSA ← Select this pump bc of NPHSR

$BHP_{pump\ 2}$=7 HP NPHSR~9.5 >NPHSA