La curva de la bomba (B1) ajusta a los datos:

$Q(m^3/h)$	4,0	6,0	8,0	10,0	12,0	14,0	16,0	18,0
H (m)	20,2	18,5	17,0	15,0	12,8	10,0	6,5	3,0
NPSHr (m)	1,9	2	2	2,3	2,7	3,1	4	5

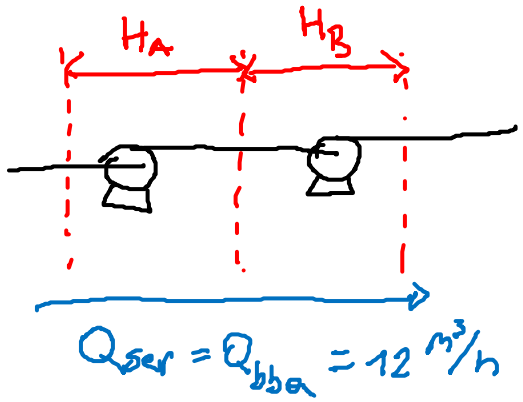
$Q \geq 12\ m^3/h \rightarrow H = 30\ m$

La curva de la bomba (B2) ajusta a los datos:

Q_{max} recomendado de operación.

$Q(m^3/h)$	4,0	6,0	8,0	10,0	12,0	14,0	16,0
H (m)	37,0	33,7	30,0	26,1	21,2	13,3	4,0
NPSHr (m)	2	2,2	2,7	3,5	4,5	5,6	7

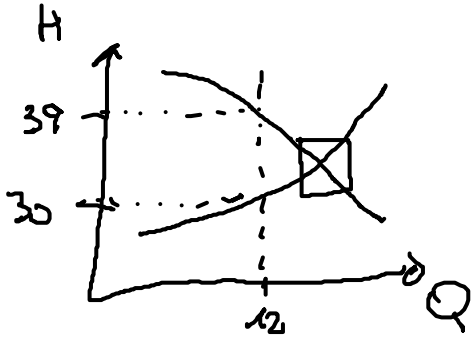
* Serie



$H_{serie} = H_A + H_B \quad (a\ Q_{bba} = 12\ m^3/h)$

$\approx 2H_i$ (si bbas iguales)

$\rightarrow H_{serie} = 12,8 + 21,2 = 34\ m > 30\ m$ ✓

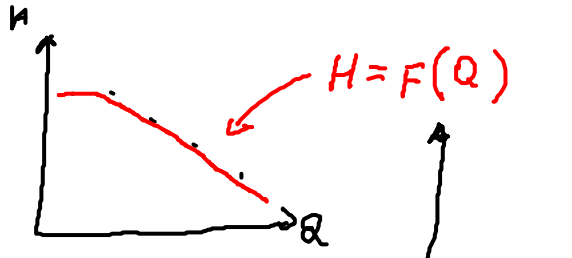


PO debe estar en el rango $4 \leq Q \leq 16\ m^3/h$

¿Como determina c. bbas acopladas?

1)

Q	$H_{serie} = H_{B1} + H_{B2}$
4	—
6	—
8	—
⋮	⋮



iguales

2) $H_{B1} = F(Q)$

$H_{B2} = g(Q)$

$H_{serie} = H_{B1} + H_{B2} = f(Q) + g(Q)$ (exp. analítica del acop)

$H_{serie} = -0,179\,Q^2 - 0,241\,Q + 61,2 \quad (4 \leq Q \leq 16\ m^3/h)$

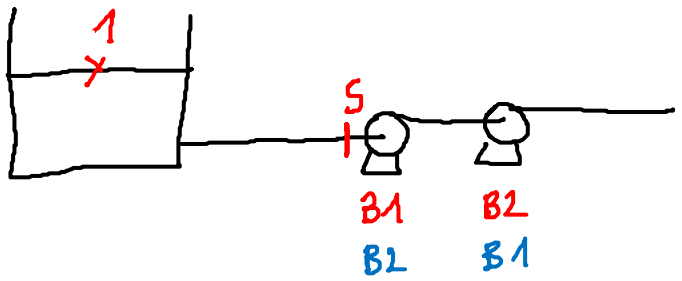
PO: $Z_{tk,mín}$ $Z_{tk,máx}$

$Q = 12,3\ m^3/h$ $Q = 12,6\ m^3/h$

$H = 31,3\ m$ $H = 29,7\ m$

dentro del rango recomendado de operación de bbas.

- Determinar riesgo de cavitación



$$NPSH_d = \frac{P_s}{\rho g} + \frac{v_s^2}{2g} - \frac{P_{vap}}{\rho g}$$

BEM entre 1 y S

$$\frac{P_s}{\rho g} + \frac{v_s^2}{2g} = \frac{P_{atm}}{\rho g} - (z_s - z_1) - f\frac{L_e}{D}\frac{v_s^2}{2g}$$

$(z_s - z_1)$: $-1\,m\ (z_{min})$, $-9\,m\ (z_{max})$

$f\frac{L_e}{D}$: 20% $L_{e\,tot}$

Considero srt de $z_{t\,min}$ $(Q_{op,min})$. $\longrightarrow NPSH_d = 6,3\ m$

$NPSH_r\ (Q = 12,3\ m^3/h)$: B1 – $NPSH_r \approx 2,8\ m$

B2 – $NPSH_r \approx 4,8\ m$

- no hay riesgo de cavitación
- mejor conexión: B1 – B2

Serie cumple el servicio

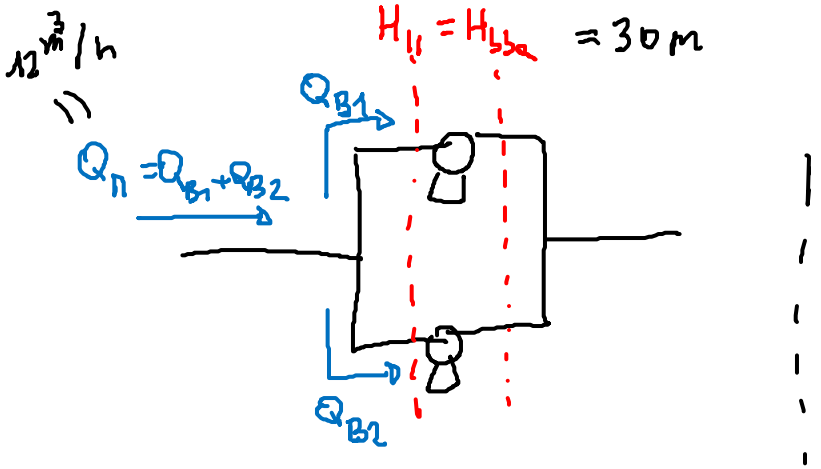
*Paralelo.

La curva de la bomba (B1) ajusta a los datos:

Q(m^3/h)	4,0	6,0	8,0	10,0	12,0	14,0	16,0	18,0
H (m)	20,2	18,5	17,0	15,0	12,8	10,0	6,5	3,0
NPSHr (m)	1,9	2	2	2,3	2,7	3,1	4	5

La curva de la bomba (B2) ajusta a los datos:

Q(m^3/h)	4,0	6,0	8,0	10,0	12,0	14,0	16,0
H (m)	37,0	33,7	30,0	26,1	21,2	13,3	4,0
NPSHr (m)	2	2,2	2,7	3,5	4,5	5,6	7



altura acoplamiento: $0 \leq H_{II} < 20,2\,m$

$H_{sist} = 30\,m > H_{II,máx}$ (20,2 m) → acop II no cumple el servicio

¿Cómo acoplar en paralelo?

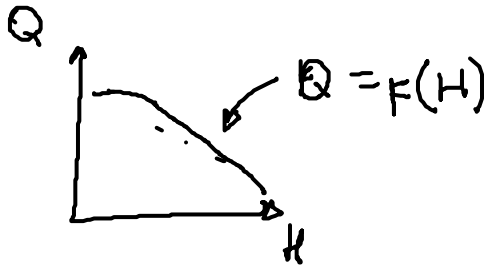
- para igual H, $Q_{11} = Q_{B1} + Q_{B2}$ para ese H

Si tengo $H_1 = F(Q)$ y $H_2 = g(Q)$

H	Q_{B1}	Q_{B2}	$Q_{11} = Q_{B1} + Q_{B2}$
→			
→			
→			
→			

→ graf Q_{11} vs H y ajustar

Q_1	H	Q_{B2}	H



$Q_{B1} = F(H)$

$Q_{B2} = F(H)$

} $Q_{11} = F(H)$

→ $H = F(Q)$

evaluar H para obtener Q_{11} y luego graficar H → Q_{11}