

Technical information

CHOOSING THE PUMPS FOR A VARIABLE SPEED SET

GENERAL INFO

A pressure booster set is sized by analysing the trend of the flow rate demand over time (for instance over 24 hours), and by examining the distribution/usage circuit. This enables the basic parameters to be defined: $Q_{\max}$, $H_{\max}$, H_{set} , maximum number of pumps working, and the possible presence of a reserve (standby) pump. In any case, to optimise the use of the set, it is necessary to find the maximum flow rate point as close as possible to the bend (relating to the parallel of all the pumps working at the maximum speed). When the conditions could be critical, the NPSH must be checked in conditions with $Q_{\max}$ - $H_{\max}$ - i.e. with all the pumps working. For the description of the various operating cases, the example is a set with three pumps of the same type.

CONSTANT PRESSURE SYSTEM SP EFC INVERTER DEVICES

With reference to the example in Fig. 1, it can be seen that when point $Q_{\max}$ - H_{set} is not positioned on the bend relating to the parallel of all the pumps working at the maximum speed, pump 1 does not work at maximum speed when the maximum flow rate is requested.

When the request diminishes, pump 1 reduces its rotation speed until it reaches a zero flow rate. At this point (M), pump 3 is stopped and pump 1 is brought to its maximum rotation speed. The variable speed pump therefore passes from zero flow rate to maximum flow rate in the tract A-B.

FIG. 1 - CHOOSING THE PUMP FOR A CONSTANT PRESSURE SET (SINGLE INVERTER)

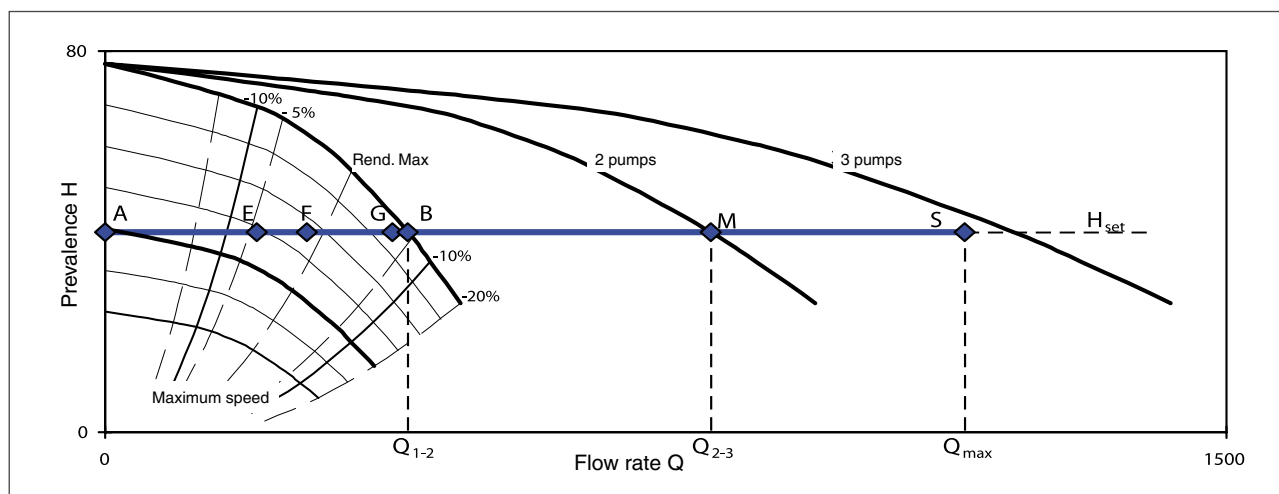
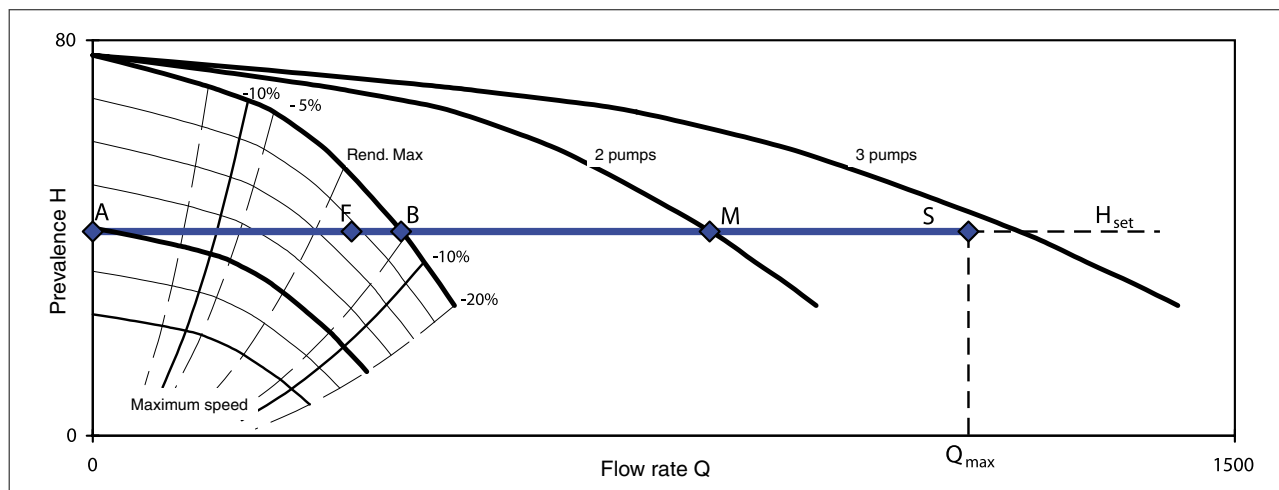


FIG. 2 - CHOOSING THE PUMP FOR A CONSTANT PRESSURE SET (MULTI-INVERTER)



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The pump must be selected on the basis of certain fundamental data:

- requested pressure H_{set}
- maximum flow rate that the single pump can work at (which must not be less than $Q_{max}/no. \text{ of pumps}$)

These values are used to examine the hydraulic bends of the variable speed pumps, selecting the one that covers the nominal pressure field for a flow rate that at least reaches the maximum described above. This point should be to the right of the maximum pump productivity point, but in any case ensuring a yield no lower than 5÷7% of the maximum.

CONSTANT PRESSURE SYSTEM SP MFC AND E-SPD+ INVERTER DEVICES

With reference to the example in Fig. 2, it can be seen that when point $Q_{max}-H_{set}$ is not positioned on the bend relating to the parallel of all the pumps working at the maximum speed, they all work at reduced speed even when the maximum flow rate is requested (point G seen on the single pump). When the request diminishes, pumps 1, 2 and 3 reduce their rotation speed until it reaches a Q2-3 flow rate (point F seen on the single pump). At this point (M), pump 3 is stopped and pumps 1 and 2 increase their rotation speed to adapt to the new conditions. If the request is further reduced, pumps 1 and 2 reduce their rotation speed until it reaches a Q1-2 flow rate (point E seen on the single pump). At this point (B), pump 2 is stopped and pump 1 increases its rotation speed to adapt to the new conditions. From now on, until the request terminates completely (point A), pump 1 works by itself. All the variable speed pumps therefore pass from zero flow rate to maximum flow rate in the tract A-B, but more markedly in the field E-B. The selection of the type of pump is made in the same way as for the single pump but, given the speed variation of all the pumps in the set, it is advisable to position the maximum flow rate point (B) so that its efficiency is closer to the maximum value with a deviation of less than 5%, and to also position point E so that it gives efficient values.

The selection of the pump is made in the same way as for the single pump but, given the presence of the fixed speed pumps, it is advisable to position the maximum flow rate point (B) so that its efficiency is closer to the maximum value with a deviation of less than 5%.

- Similar considerations can be made when selecting the pump in cases of stepped pressure drop compensation via pressure sets that grow with the increase in the number of pumps fitted (Fig. 3). Depending on the number of pumps fitted, pump 1 will work (modulating its speed) on tract A-B = when it works alone ($H_{set.1}$), on tract C-D = when it works in parallel with pump 2 ($H_{set.2}$), and on tract E-F = when it works in parallel with pumps 2 and 3 (H_{max}).
- Similar considerations can be made when selecting the pump in cases of stepped pressure drop compensation via pressure sets that grow with the increase in the number of pumps fitted (Fig. 4). Depending on the number of pumps working simultaneously, each of them will work (modulating their speed) on tract A-B = when pump 1 works alone ($H_{set.1}$), on tract C-D = when pumps 1 and 2 work in parallel ($H_{set.2}$), and on tract E-G = when all three pumps work in parallel (H_{max}).

CONSTANT FLOW RATE SYSTEMS

Not knowing the type of system, it is impossible to give any further indications here for the selection of the pump, apart from those given for single pumps.

MECHANICAL INSTALLATION

The set must be positioned on a flat, protected surface in an area with reserved access, where there is sufficient space for maintenance and removal. If not fitted with anti-vibration supports, the set can be anchored to the floor using foundation bolts.

- The diameter of the connection pipes must be at least equal to (no smaller than) the intake and delivery manifolds of the set; they must be as short and straight as possible and with a path that always ascends towards the pumps, using the least number of bends and avoiding goosenecks that may cause drain-traps or air pockets. You are advised to use metal pipes with a good degree of rigidity to avoid any risk of collapse.
- All the threaded or flanged connections must be well sealed to prevent air infiltration.
- Supports, anchoring systems, pipes and other system components must be independent of the set, to avoid creating additional loads or strain on it.
- It is advisable to install a shut-off valve downstream of the set.

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- To avoid vibrations in the system pipes, it is a good idea to install compensation joints on the intake and delivery lines of the set.
- Always install a foot valve in above-head conditions.
- When testing the set, add a T union with a shut-off valve downstream, along with the relative recirculation pipe leading to the intake tank (if the water is to be recovered).

FIG. 3 - CHOOSING THE PUMP FOR A STEPPED PRESSURE DROP COMPENSATION SET (SINGLE INVERTER)

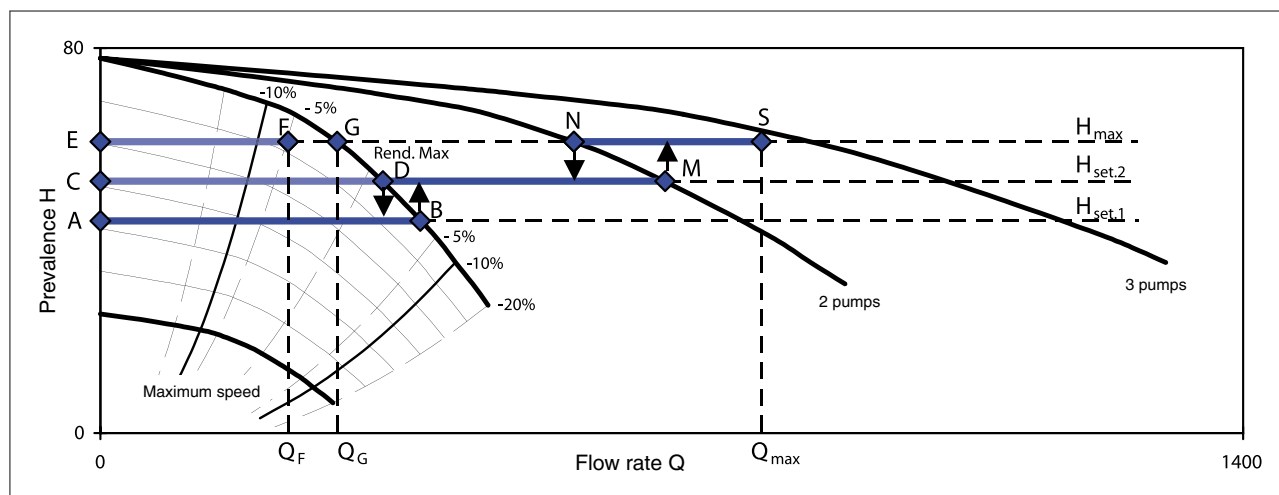


FIG. 4 - CHOOSING THE PUMP FOR A PRESSURE DROP COMPENSATION SET (MULTI-INVERTER)

