



## Parallel Pumps Can Provide Multiple Benefits

Applying parallel pumps in a system can be a cost-effective solution when capacity requirements call for an unrealistically large pump and motor. Using parallel pumps can also reduce current surge during motor start-up by staging two or more smaller pumps. This is a problem which may otherwise require expensive equipment such as electronic soft starters or part-winding type motors.

One of the most notable benefits of parallel pumps is the redundancy built into the system. If one pump were to fail in a two-pump system, the second pump would not only continue to operate, but would also increase its output.

### Pump Selection Critical

Figure 1 shows a typical piping arrangement for a two-pump parallel system. Total system flow is typically divided equally between the two pumps. Significant problems may be encountered when running two differently sized pumps together in parallel. If not carefully selected, one pump can overpower the other and force its check valve to close, causing a potentially dangerous situation. This is not to say it cannot be done, just that it must be analyzed very carefully.

Identical pumps will produce the same flow at a particular discharge pressure. With the help of the ESP-PLUS equipment selection program, let's look at an example. Our sample system has a total

flow of 2800 GPM at 110 feet. Each pump is sized for half the flow (not half the head) - 1400 GPM at 110 feet. Figure 2 shows the pump curves for one pump operation (H) and for both pumps operating

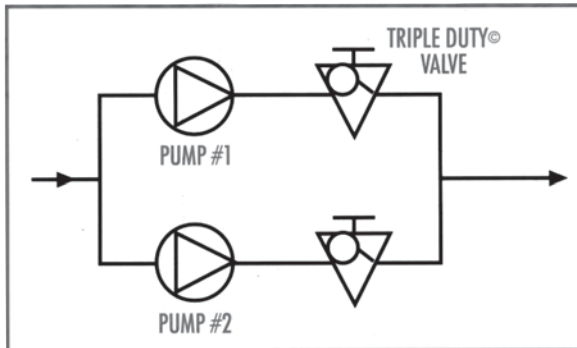


Figure 1: Typical piping arrangement for a two-pump parallel system

Point A in Figure 2 is the operating point of each pump. Point B shows the flow for both pumps operating together. Since the amount of flow produced by a centrifugal pump is dependent on the amount of resistance it must overcome, a system can only operate where the system curve crosses the pump curve. For the design condition, this is the point where the system curve crosses the combined pump curve.

The beauty of parallel pump systems: If one pump were to fail, the second pump would run out on its curve until it crossed the system curve. Remember the pump can only operate where it crosses the system curve, at point C. For our example, the flow for one-pump operation is 2130 GPM

(76% of the total design flow!)

When selecting parallel pumps, specify motors that are nonoverloading across the entire pump curve. This assures enough horsepower during single-pump operation.

Will all pumps work like this? No.

### Not All Pumps Are Equal

When selecting parallel pumps, always look at the pump and system curves to ensure the system curve crosses the single pumps curve. In some cases it will not. In these cases, the performance of the system may be jeopardized during one-pump operation.

Since the system can only operate where the pump curve crosses the system curve, and the published curve ends before it crosses the system curve, no one knows how the system will operate under these circumstances. Pump manufacturers only

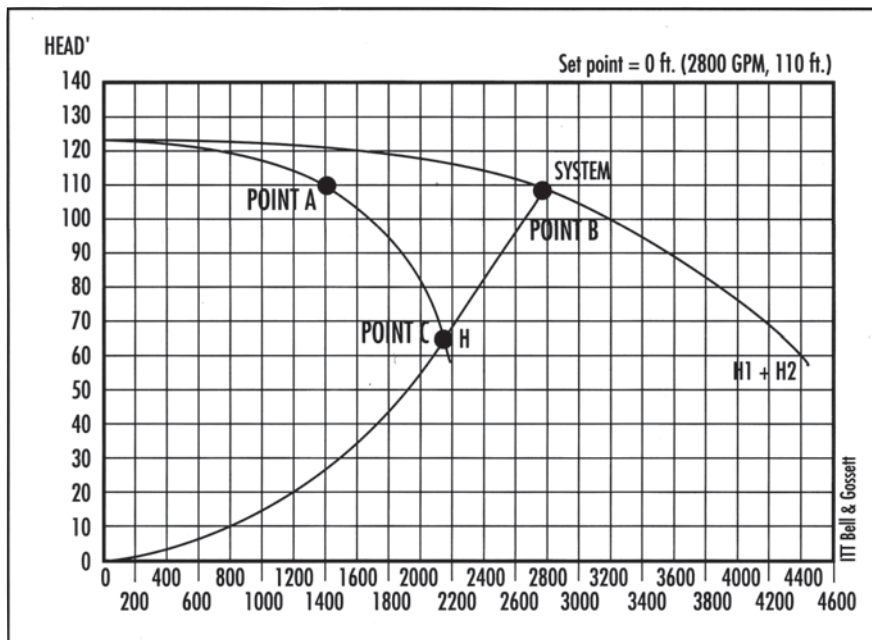


Figure 2: The pump curves for one-pump operation (H) and for both pumps operating together (H1 + H2)

ing together (H1+H2). The combination curve is drawn by doubling the flow of the single pump. A system curve could be drawn from the operating point to the origin using the well-known Bell & Gossett System Syzer®: Head varies as the square of a change in flow. Before ESP, these curves had to be drawn manually.

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## SPECIFYING TIPS

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### Parallel Pumps

publish the portion of the pump curve that they recommend for usage. Operation of the pump beyond the end of the published curve may be unpredictable. In addition, the pump may be damaged due to cavitation caused by significantly increased NPSH requirements.

### Three Pump Systems

To ensure proper operation of the system, specifications for parallel pumps

should call out that a manufacturer's pump curve shall cross the system curve for both single pump operation and combined operation. For variable speed applications, the term "control curve" should replace "system curve".

On three-pump parallel systems, it becomes more difficult to find a pump selection where one pump crosses the system curve. Since two pumps need to fail before single-pump operation, it can be an acceptable risk. However, the pumps still should be selected where the two-pump operation curve crosses the

system curve.

One last word. Some pump controllers, like B&G's Technologic® Series, offer end-of-curve protection as an option to protect the pumps from operating beyond the end of the published pump curve. You'll want to ask about this optional feature.

This article was written by Bell & Gossett engineers. If you'd like additional information on ESP-PLUS, Technologic, or any other B&G products, contact your local Bell & Gossett representative.

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## B&G Little Red Schoolhouse In The News

The Little Red Schoolhouse recently celebrated 50 years of helping to educate more than 1 million HVACR professionals.

Here's what the industry has to say about the many contributions and value that the Schoolhouse has made over the years:



"In the last half-century, the HVAC/R educational facility has trained more than 50,000 students in Morton Grove and more than 125,00 worldwide through its "traveling classroom" program."

*Consulting-Specifying Engineer*

"I don't think it's an exaggeration to say a million or more have been touched by the schoolhouse..."

*Supply House Times*

"Although the methods of training have changed from a blackboard

to computers and electronic projection, the educational principles and value to students have remained true."

*Fuel Oil News*

"1954 was a year of 'firsts'. The first kidney transplant took place, the first atomic submarine was launched, and in Morton Grove, IL, Bell & Gossett first opened its Little Red schoolhouse training center."

*Pumps & Systems*

"One of the school's strengths is its system-based concept of teaching, rather than focusing on product features and benefits."

*PM Engineer*

(Bell & Gossett held a reception to) ... "share with the industry the many innovations and trends in education that have originated from the educational institution."

*The NEWS*