Redundancy with parallel-connected drives

In a parallel system the process will continue running with a limited capacity even when part of the system is inoperative.

Definition of redundancy

A dictionary definition for redundancy is "serving as a duplicate for preventing failure of an entire system upon failure of a single component".

In pump stations this means that the failure of one pump, motor or variable speed drive (VSD) in a parallel installation does not cause an interruption of the process, but the operation can continue with a limited capacity.

Redundancy is also applicable to sensors - if one level or pressure sensor fails, the system will detect this and continue its operation using other sensors.

Redundancy with ABB industrial drives for pump control

In order to have a replacement for an inoperative unit a parallel system is needed. This means two to eight pumps, each controlled by an ABB industrial drive for pump control (Intelligent Pump Control, IPC).

These VSDs share information such as drive status, priority, running time, process feedback, etc., through a fibre optic link.

In a ring connection implemented with fibre optics it is possible to define the actions for the VSDs in the event that the optical link is inactive. These actions are defined with the following parameters.

- 60.17 MASTER LOSS
- 60.18 F T M COMM LOSS
- 60.19 COMM DELAY
- 60.20 ALL FOLL LOST.

A 100% redundancy is achieved with a fibre optic star connection between the drives through the branching unit NDBU-95. This setup is the factory recommendation.

Dynamic master/follower communication

In all parallel control systems, a master and a number of followers are needed to handle the communication between the VSDs. In normal conditions, a breakdown of the master VSD shuts off the whole system.

In the IPC approach, the master VSD is dynamically replaced, whenever needed, to avoid a shutdown of the whole system.

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Product notes

With parameter 60.08 MASTER ENABLE it is possible to specify which of the VSDs are enabled as master. In a redundant system, at least two VSDs must be defined as master enabled. During the pumping process the master VSD is changed in 0.5s whenever a new pump is switched into the system or the master VSD becomes inoperative.

A separate process feedback signal is required for each master VSD to provide for full redundancy.

Benefits

In most cases downtime of a pump station is not accepted, because of the extra cost arising from lost production and ad hoc maintenance.

A redundant system built with fibre optic cables is a simple and easily configurable way to ensure the usability of the pump station in all conditions.

The 100% redundancy achieved with the fibre optic star connection keeps the system up and running even when part of the system is inactive. In parallel installations, it makes no difference whether it is the master or a follower that becomes inoperative.

Downtime at a pump station always means extra cost. This can be avoided by building a redundant system with fibre optic cables.
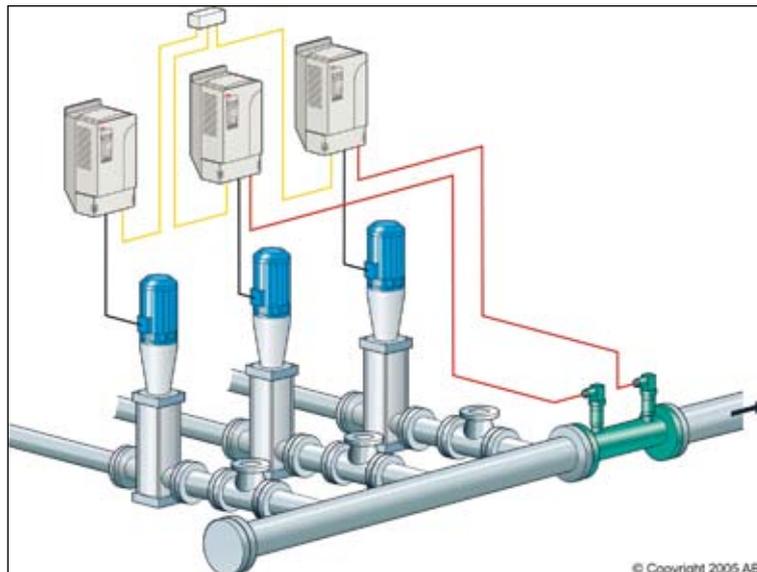

ABB industrial drives for pump control connected in a star configuration through fibre optics ensures 100% redundancy in pump stations.

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ABB

ABB Oy
Drives
P. O. Box 184
FI - 00381 Helsinki
Finland
Telephone +358 10 2211
Telefax   +358 10 222 2287
Internet   www.abb.com/drives