# Dynamatic Variable Speed Drives and Controls Solves Aging Infrastructure Problem

### *Columbus Ohio:*

After 36 years of service, the original controllers, at the Columbus Ohio, pump station began to overheat. To compensate, the pump station installed temporary air conditioning to cool the controls. This kept them in service while they made plans for a permanent solution. Arcadis Engineering was contracted to diagnose the problem. They recommend a solution, by designing extensive upgrades to the pump station, including refurbishments to the 41-year-old pumps. They decided that variable speed would still be required, thinking that VFDs would be the obvious choice. However, since it was originally eddy current drives, Arcadis, invited Dynamatic to visit the site to offer suggestions for solving the controller overheating, as well to evaluate the condition of the existing motors and eddy current drives.

Dynamatic noticed that the controllers were operating at a higher level of current than the eddy current nameplate required, which accounted for the overheating. The excess current was evidence that there was a problem with the field windings in the eddy current drives. At this point, Dynamatic was asked to offer a comprehensive overhaul of the existing units, including the motors.

After interviewing Dynamatic and several VFD/Motor vendors, the City and Engineer concluded that Variable Frequency Drive's, cost, space considerations and cooling requirements were not favorable for the project. Their best option was to replace the Eddy Current Drives in kind with new Dynamatic SPMV-8260 units, they are rated at 1250 hp, 514 rpm, 4160 volts. The most influential factor for the replacement, was the expected life span of the products. They received one report from a VFD vendor, to expect the life span of a VFD to be about 7 years. Dynamatic drives and digital controls have been proven to outlast VFDs by as much as 6:1, dramatically reduce the pump stations lifetime operating costs.



***Top: Ideal Electric Units CAV61320 vintage 1976 unit***
***Above: Dynamatic SPMV-8260 unit***
***Both installations are rated 1250hp, 514rpm, 4160 volts***

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## Dynamatic® Drives: How they work

A VFD uses AC-to-DC voltage conversion, high-frequency sampling, and a powerful inverter in a large electronics rack to alter the speed of and to supply the operating voltage to an AC motor. A Dynamatic® drive uses eddy-current technology consisting simply of a constant speed AC induction motor and a magnetic clutch speed driven by a small analog or digital controller. The clutch uses an eddy-current coupling to vary the speed of an attached output shaft. DC voltage applied to a field coil in the clutch produces a magnetic field, which generates an attracting force to the inside of a hollow iron drum. The amount of power available is determined by the size of the motor, which can range from relatively small to motor, 4000 HP or more.

## Efficiency Considerations:

At maximum clutch coupling, the total efficiency for Dynamatic® drives is just below that of the motor alone. A Dynamatic® drive's control unit supplies voltage to the clutch's coil and only requires 2% or less of the drive's total power. As the process speed reduces, the losses in an eddy-current clutch rise in proportion to the slip relative to VFDs, this creates an efficiency crossover point between 75% and 80% of motor base speed. Above this crossover point, the Dynamatic® drive is more efficient. Below this point, the VFD makes up for its initially higher control losses and becomes the better efficiency choice.

## Dynamatic® Drive advantages:

Dynamatic® drives have an inherent long-term reliability advantage and function well in both adverse operating conditions and remote locations. Cooling, power management, and maintenance are minor and include only those service processes required for stand-alone AC induction motors. For systems that operate at 75 to 80% of base speed or higher a majority of the time, better efficiency is also a benefit.

Parts interchangeability and the availability and ease of replacements and upgrades make Dynamatic® drives a great long-term investment. Maintenance costs are low and can be completed by facility staff.

### Up to 65% lower capital pump-drive system costs

| Considerations: | Variable Frequency Drives | Dynamatic® Drives |
|---|---|---|
| Total cost of installation | Varies widely by operating environment and space requirements; can be extensive | Up to 65% lower than VFDs in 4160VAC and 2300VAC installations; comparable primary equipment costs in 480VAC and 575VAC installations |
| Cooling/air conditioning | Often required | None required |
| Power regulation | Recommended | None required |
| Electronic footprint | Very large | Small |

### Higher overall system operating efficiency

| Considerations: | Variable Frequency Drives | Dynamatic® Drives |
|---|---|---|
| Long-term reliability | 3-5 year manufacturing run, planned obsolescence | 20-40 year average life of mechanical components; 15-20 year control life |
| Optimum efficiency at 75-100% operating speed | NO | YES |
| Ancillary equipment energy usage | YES | NO |

### Lowest lifetime cost of own hip

| Considerations: | Variable Frequency Drives | Dynamatic® Drives |
|---|---|---|
| Harmonic noise / RF interference | Extensive | None |
| Long-term cost of operation | Can be extensive | Minimal |
| Line voltage sensitivity | Extensive | Minimal |
| Heat / cold sensitivity | Extensive | Minimal |
| Upgradable to new components | Limited | Available |
| Cost of replacement parts | Can be high, if available | Low |
| Replacement parts availability | Limited, if at all after 5-8 years | Excellent: 40+ year manufacturing period |
| Service and repair | Complex (by factory personnel) | Simple (by customer) |
| Inter-brand support | NO | YES |
| Downtime if problems with electronics | Can be weeks or months | Minutes (simple component swap-out) |