Dynamatic adjustable speed drives and digital controls

TRUE system efficiency

Electromagnetic adjustable speed drives and digital controls for TOTAL drive system efficiency and performance

- ***Lower capital costs***
- ***Lower energy costs***
- ***Lower ownership costs***

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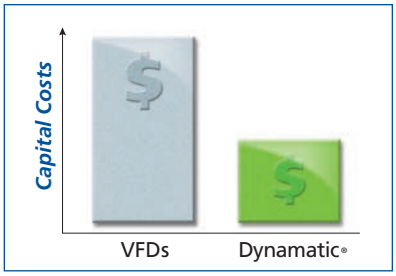
“True efficiency” is defined by three important cost factors:

1 Capital Costs – up to 65% less than VFD systems

Capital costs include application engineering, product procurement, system installation and commissioning. For typical VFD installations, added costs can occur in each of these areas due to system complexity and required ancillary components such as harmonic mitigation and system cooling. Compared to these highly complex variable frequency drive installations, especially in medium voltage pump applications, a new Dynamatic system can typically save municipalities from 50% to 60% on product procurement costs alone. Dynamatic systems feature advanced, yet simple to use, digital control integration.



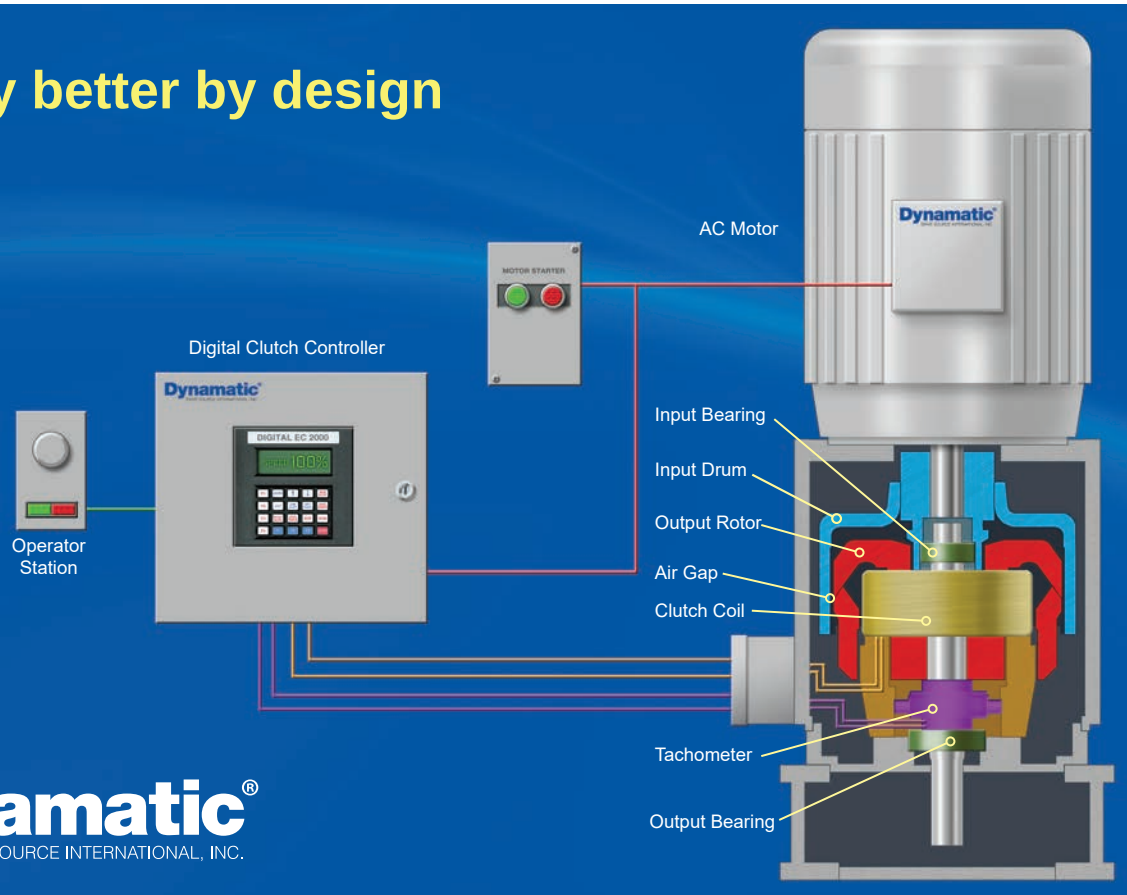
Dynamatic drive systems have saved municipalities hundreds of thousands of dollars in capital costs, notably in medium voltage pumping applications, compared to variable frequency drive (VFD) installations.

- Up to 65% less initial cost than VFDs in medium voltage applications
- Immediate savings of potentially $1M+ on first costs
- No ancillary costs for conditioning/cooling and harmonic suppression
- Lower cost installation and commissioning due to less complex systems
- Advanced yet simple to use digital control integration
- Electronics are 60-70% smaller than comparable medium voltage VFDs
- Unlike VFD medium voltage controllers, ECD controllers occupy a very small footprint

Consider all the costs associated with a pump-drive system

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

Simply better by design



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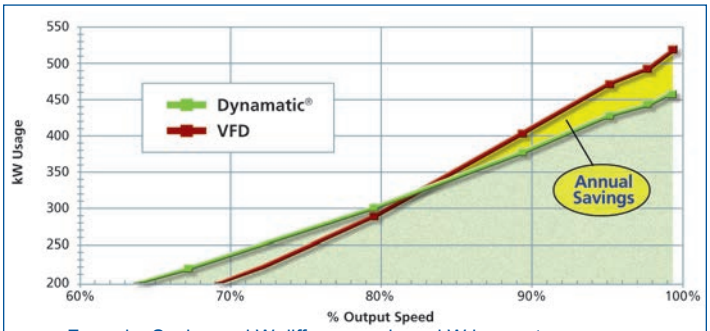
2 Energy Costs – lowest for wastewater pumping applications

The operating efficiency of a Dynamatic drive increases relative to the normal operating speed of a motor. This makes the Dynamatic drive ideally suited to most wastewater pumping applications, which typically require controlled speed within the range of from 75% to 100% of the motor's rated speed. In contrast, the operating efficiency of a variable frequency drive decreases across this range. In addition, VFD operating efficiency can be further diminished by added energy costs incurred by required ancillary VFD system components.

- Most wastewater pumping applications require 75-100% rated speed
- Dynamatic drives use less energy to operate in these applications than VFDs
- Unlike VFDs, you do not pay for required cooling and harmonic protection
- Digital closed-loop control uses less than 1% of the total AC input current to the motor
- Lower peak demand costs: no multiple, medium voltage motor starting and stopping
- Capable of continuous operation in 40° C ambient temperature
- No ancillary equipment energy consumption such as external cooling and harmonic mitigation

Dynamatic vs. VFD – kWh usage for 500HP 880RPM motor



Formula: Savings = kW difference x hrs x kW hour rate

Example @ 90% output speed,12 hours per day, $.08 per kWh:
Efficiency difference = VFD kW – Dynamatic kW = 410 – 390 = 20 kW
Dynamatic yearly savings = 4380 hrs x .08 x 20kWh = $7008

Dynamatic electromagnetic drive efficiency is ideally suited to wastewater pumping applications, which typically require from 75% to 100% motor speed regulation to move water. When operating efficiency is factored along with medium voltage first costs and lifetime ownership costs, total savings are often dramatic compared to variable frequency drive installations.

Consider all the benefits of higher overall system operating efficiency

Considerations:	Variable Frequency Drives	Dynamatic® Drives
Lifespan	10-12 year average life with 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

Dynamatic Electromagnetic Drive Technology

The Dynamatic adjustable speed drive system consists of a constant speed AC induction motor and an electromagnetic clutch, governed by a small digital controller.

Dynamatic allows the AC motor to run at its optimum rated speed. A simple electromagnetic coupling (clutch) is used to vary the output speed.

The only wear parts are bearings and brushes, since the motor and drive are separated by an air gap. By regulating voltage to the clutch coil, a magnetic flux field is generated in the gap and distortion of the flux field creates torque. Output speed is governed by the digital control. The greater the power to the clutch coil, the greater the strength of the magnetic flux field, and the greater the output torque/speed.

The feedback signal from the tachometer is compared to a reference signal within the controller to maintain accurate speed within 0.5%. This closed-loop speed system typically uses less than 1% of the total AC input current to the motor.

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3 Ownership Costs – greatly reduced maintenance, repairs and upgrades

For decades, Dynamatic drives have outlasted variable frequency drives in a wide range of wastewater applications. In fact, Dynamatic drives have been shown to outlast VFDs by as much as 6:1. Their rugged and reliable electromagnetic clutch design is highly tolerant of fluctuations in power quality. Unlike VFDs, Dynamatic systems produce virtually no harmonic noise into your plant's electrical system or onto the utility grid. By comparison, VFDs continue to be complex devices bearing higher ownership costs with shorter product life cycles. These significantly higher costs are attributable to quicker VFD product series obsolescence, faster parts obsolescence and earlier forced product replacements.

- Proven rugged and reliable electromagnetic clutch design
- Systems have outlasted VFDs by as much as 6:1
- Easy to maintain by on-site staff using low-cost parts
- Service and repair can often be performed by maintenance staff
- Unaffected by power quality fluctuations that can destroy VFDs
- Unlike VFDs, no annoying audible whine enters the work environment
- Produce virtually no harmonic distortion into your electrical system or power grid

Consider the costs over the lifetime of ownership

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)

Dynamatic Eddy-Current Drives are easy to maintain with a long life span typically 6:1 compared to variable frequency drives.

Dynamatic adjustable speed drives and digital controls

New Electromagnetic Adjustable Speed Drives

- Horizontal and vertical drive systems up to 4,000 HP
- Original Dynamatic® and Eaton Dynamatic® brand parts
- Factory remanufactured drives and controllers
- One-year factory warranty

Simple, Versatile, Digital, Electromagnetic Drive Controls

- EC2000 digital control for new installations or retrofit of all brands of eddy-current drives
- PLC and SCADA compatible
- Local and remote access to pre-programmable run presets
- Outputs do not require separate external DC supply
- RS232, RS422 or RS485 serial connections
- Small and compact – typically fits most existing motor control enclosures

Services

- OEM parts, repairs and replacement
- Adjustable speed drive system engineering and startup support
- Custom-engineered electromagnetic digital control upgrades
- All products and systems 100% factory tested
- Including original Dynamatic OEM specifications
- 24-hour hotline: 1-800-548-2169

Other products and services...

- AC and DC motors
- Custom engineered controls
- Gear motors and speed reducers
- Water-cooled clutches and brakes
- Rebuilds and refurbishments

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MC-BR-001-02 (April 2024)