SMART MOTOR CONTROL SOLUTIONS FOR THE WATER INDUSTRY

Rockwell Automation architectures for more sustainable water management
Sustainable water management matters


Today’s municipal water utilities are challenged to maintain a consistent supply of affordable clean water – and to do so sustainably.

And that means focusing on ways to improve resource management – and energy efficiency. **Smart Motor Control Solutions** can help utilities achieve their goals in critical applications including:

- Pumping
- Dewatering
- Aeration

Rockwell Automation **Smart Water solutions** accelerate the transformation to digital operations and help utilities improve resource management.

- **30-40% of municipal energy** Used for water/wastewater plants.
- **40% of drinking water costs** Attributed to energy.
- **45 tons annually of greenhouse gases** Generated by US drinking/wastewater operations.

Source: U.S. Environmental Protection Agency
Solution architecture
for municipal water/wastewater systems

Our integrated solution featuring Allen-Bradley® PowerFlex® AC drives optimizes lifecycle performance

A unified solution that integrates automation systems and motor control

- Reduces engineering and commissioning time and costs
  When used with Logix controllers, PowerFlex drives deliver a Premier Integration experience that simplifies design and integration.

- Decreases energy usage
  Enables reduction of motor speed, resulting in significant energy savings. Reducing speed 20% can result in 50% less energy.

- Improves power quality
  Provides built-in harmonic mitigation and power factor correction.

- Maximizes uptime
  Delivers monitoring and predictive maintenance capabilities.
Smart Motor Control for pumping systems

Solutions designed to meet key utility challenges:

• Increase pump output to meet increased capacity demands
• Improve energy efficiency
• Reduce engineering and installation costs
• Avoid unexpected downtime
Critical role of pumping systems in water applications

<table>
<thead>
<tr>
<th>Vertical Turbine</th>
<th>Horizontal Split Case</th>
<th>Submersible &amp; Dry Submersible</th>
<th>Positive Displacement</th>
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<tbody>
<tr>
<td>WATER TREATMENT</td>
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<td>For high-service finished water, low-service raw water and booster applications</td>
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<td>WASTEWATER</td>
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<td>For raw sewage and effluent systems</td>
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<td>FLOOD CONTROL</td>
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<td>For moving large amounts of water quickly</td>
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“Pumping accounts for 90–99% of energy consumption by public water systems.”

Source: U.S. Environmental Protection Agency
Simplified motor control architecture for pumping systems

Remote pump station

- EtherNet/IP
- ControlLogix controller
- IntelliCENTER medium voltage MCC
- PowerMonitor 5000 power meter
- PowerFlex 7000 medium voltage drive
- Submersible pump

Wastewater treatment plant

- EtherNet/IP
- ControlLogix controller
- IntelliCENTER low voltage MCC
- PowerMonitor 5000 power meter
- PowerFlex 753 low voltage drives
- Circuit breaker
- High service pump 1
- High service pump 2
- Return activated sludge (RAS) pump
- Waste activated sludge (WAS) pump
- Influent pump
Improving system visibility, communication and performance

**Process Control for Water/Wastewater:**
Increase flexibility and enable better decision making with the PlantPAx® distributed control system (DCS).
Based on open communication standards leveraging EtherNet/IP, this modern DCS connects process, discrete, power, information and safety control into one plant-wide infrastructure.

**ControlLogix® Controller:**
Configure drive operation and control in the Logix environment and enable a simpler, Premier Integration experience.
Speed development time and more easily connect to critical device information in one unified software environment.

**PowerFlex 7000 Medium Voltage Solutions:**
- Easy and fast power connections.
- Master-follower configuration.
- Premier Integration with Logix control platform to simplify parameter and tag programming and reduce development time.

**Dynamix™ Integrated Condition Monitoring System:**
Dynamically monitor sensor information (vibration, speed, etc.) to identify potential equipment issues before failure occurs.

**Remote pump station**

**Wastewater treatment plant**

**Open EtherNet/IP Network Across All Levels:**
Reduce engineering and maintenance costs by securely integrating devices like your MCC, I/O, field instruments and other third-party devices over an EtherNet/IP network.

**FactoryTalk® InnovationSuite:**
Remotely monitor assets, predict equipment failure and identify improvement opportunities.

**IntelliCENTER® MCCs:**
Streamline setup and enhance visibility between process and motor controls. Use network connectivity to quickly monitor, troubleshoot and diagnose issues.

**PowerFlex Low Voltage Drives:**
Enable seamless integration into Logix control architectures along with Automatic Device Configuration, thanks to Premier Integration.
Drives with Active Front End technology deliver built-in harmonic mitigation:
- Reduce the impact of harmonic distortion to support IEEE 519 compliance.
- Decrease panel and floor space requirements.
- Cut wiring and installation time/costs.

**Dynamix™ Integrated Condition Monitoring**
Incorporate detailed power quality information into management systems for analysis and resolution.
The power meter measures current and voltage and calculates an extensive array of power quality information to help uncover not only incoming power issues, but also those occurring throughout a facility.

**PowerMonitor™ 5000 Power Meter:**
Reduce equipment wear and tear by implementing smooth acceleration and deceleration curves instead of the traditional trapezoidal motion profiles - no special programming required.
Continuously monitor operation and remaining life of components based on actual operating conditions.

**PowerFlex Drives with TotalFORCE® Technology:**
Sustainable water management
Unified solution architecture
Pumping systems
Dewatering systems
Aeration systems
Case study

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**Graphical Diagrams:**
- Remote pump station and Wastewater treatment plant configurations with various components like PowerFlex drives, PowerMonitor power meters, and other control and monitoring systems.
SOLUTION AT A GLANCE
Integration with IntelliCENTER
Motor Control Center

**Enhanced safety**
- Isolated devices, patented CENTERLINE® bus structure, rigorous global certification and testing
- Best-in-class features, including ArcShield™ and SecureConnect™ technology

**Streamlined maintenance**
- IntelliCENTER software delivers real-time diagnostics and MCC documentation
- Displays device data, including critical status information

**Simpler configuration**
- IntelliCENTER software enables configuration and programming of all intelligent motor control devices in Studio 5000®

**Better system security**
- Tighter control of sensitive assets
- Complies with IEC 62443-3-3

**Powerful network integration**
- Centralized location for power and motor control devices
- Incorporates vibration monitors, surge protectors and power monitors
- Ships preprogrammed and ready to install

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LESS RISK | FASTER COMMISSIONING | LOWER MAINTENANCE COSTS

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Sustainable water management
Unified solution architecture
Pumping systems
Dewatering systems
Aeration systems
Case study

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SOLUTION AT A GLANCE

Energy Management Solution

Optimize operations with better energy management

- Improve awareness of energy consumption, demand and real-time power quality
- Identify root cause of costly energy-related downtime and equipment failures
- Enable better monitoring and reporting – and advanced analytics enterprise-wide

Energy IIoT Solutions Platform

Real-time Energy Management

Hardware

- PowerMonitor
- Drive
- Energy Meter
- Controller
- Database / Application

Energy monitoring
- Emissions monitoring
- Performance KPIs
- Data correlation
- Reporting
- Advanced analytics

- Real-time energy and production monitoring
- Power management (Load shedding and schedules)
- Process optimization
- Demand management and tariffs
- Power quality

- Meters electric and non-electric
- Power control
- Production data
- Other databases / Applications

PLANT MANAGER
SUSTAINABILITY MANAGER
MAINTENANCE MANAGER
OPERATIONS MANAGER
OPERATOR OR TECHNICIAN

Sustainable water management
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Smart Motor Control for dewatering

Solutions designed to meet key challenges in centrifuge applications:

- Optimize moisture removal and increase dry solids content
- Maximize energy efficiency
- Maintain reliable performance
- Enable remote operations
- Avoid unexpected downtime
Typical dewatering centrifuge control/power cabinet layout

Centrifuge cabinet layout with primary components

PanelView™ 5000 HMI

Transformer

PowerFlex 755TL low voltage drive

Circuit breaker

Line reactors

ControlLogix controller

EtherNet/IP

Centrifuge
Smart Motor Control for aeration

Solutions designed to meet key challenges in aeration applications:

• Conserve energy while processing large volumes of water
• Ease operation
• Minimize unplanned downtime
• Enable real-time monitoring
Simplified motor control architecture for aeration systems

CompactLogix controller

PlantPAx DCS client

Stratix managed switch

IntelliCENTER low voltage MCC

PowerFlex 753 low voltage drive

SMC-50 soft starter

PowerMonitor 5000 power meter

Circuit breaker

Positive displacement blower

Rotary lobe blower

Packaged high speed turbo blower (Controller, drive and operator interface are integrated in this packaged unit from the manufacturer.)

EtherNet/IP
Driving more uptime and energy savings

**CompactLogix™ Controller:**
Configure drive operation and control in the Logix environment and enable a simpler, Premier Integration experience.
Speed development time and more easily connect to critical device information in one unified software environment.

**PowerFlex Low Voltage Drive:**
Enable seamless integration into Logix control architectures along with Automatic Device Configuration, thanks to Premier Integration.
Drives with Active Front End technology deliver built-in harmonic mitigation:
- Reduce the impact of harmonic distortion to support IEEE 518 compliance.
- Decrease panel and floor space requirements.
- Cut wiring and installation time/costs.

**PowerMonitor 5000 Power Meter:**
Incorporate detailed power quality information into management systems for analysis and resolution.
The power meter measures current and voltage and calculates an extensive array of power quality information to help uncover not only incoming power issues, but also those occurring throughout a facility.

**Process Control for Water/Wastewater:**
Increase flexibility and enable better decision making with the PlantPAx distributed control system (DCS).
Based on open communication standards leveraging EtherNet/IP, this modern DCS connects process, discrete, power, information and safety control into one plant-wide infrastructure.

**SMC™-50 Soft Starter:**
Enable advanced monitoring and protection – and superior communication capabilities.
Increase efficiency and reduce downtime with Energy Efficiency mode.

**FactoryTalk InnovationSuite:**
Remotely monitor assets, predict equipment failure and identify improvement opportunities.

**Open EtherNet/IP Network Across All Levels:**
Reduce engineering and maintenance costs by securely integrating devices like your MCC, I/O, field instruments and other third-party devices over an EtherNet/IP network.
California sanitation district reduces energy consumption 47%

Challenge
Obsolete aeration system accounted for 85% of plant’s electricity usage.

Solution
Integrated motor control and SCADA system features PowerFlex AC drives, Logix controllers and FactoryTalk software.

Results
Decreased energy consumption – and qualified for significant state rebate.