



# Enabling the **connected cement plant**

Rockwell Automation process solutions for cement



# State of the industry



22%

## POPULATION GROWTH AND URBANIZATION

POPULATION TO GROW 22% by 2050 from 7.6 B to 9.7 B

2.5 B ADDITIONAL PEOPLE are expected to live in cities by 2050

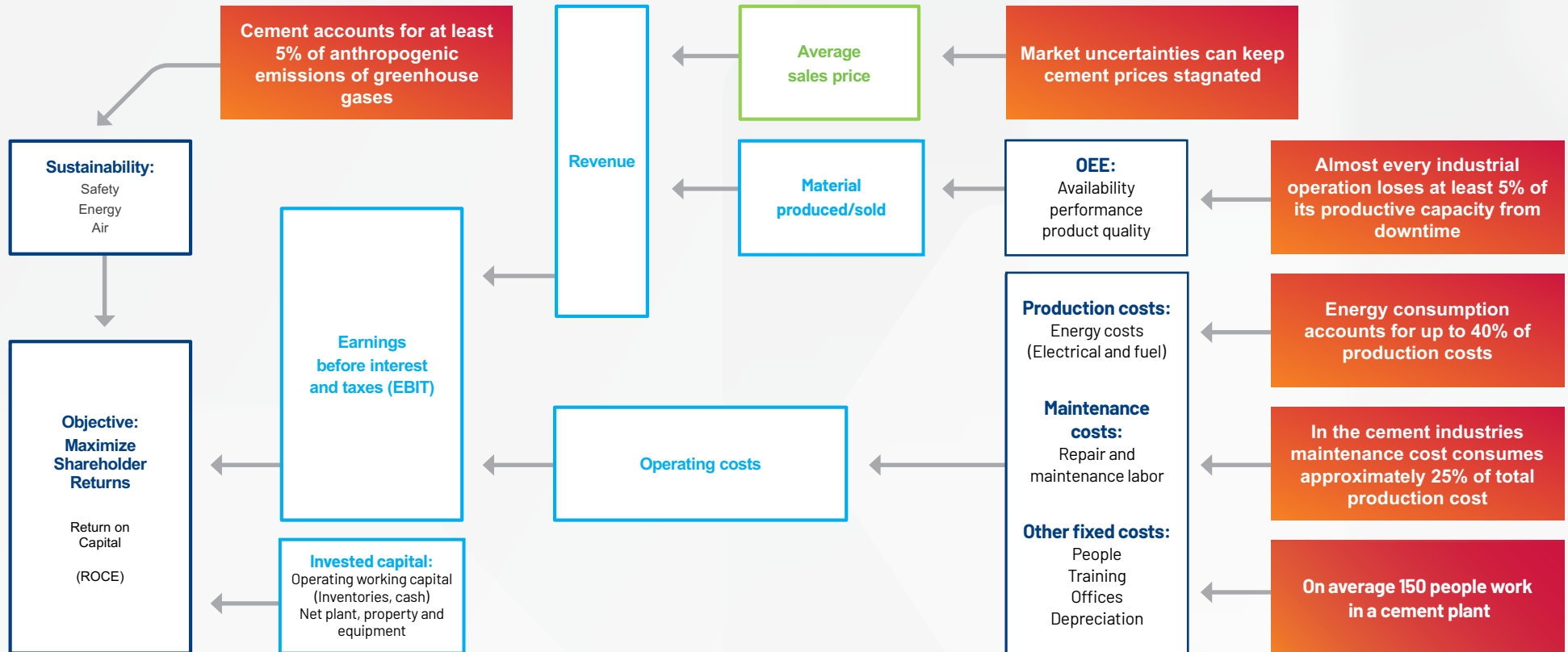
### The world is changing. So are cement needs.

Worldwide trends will greatly impact the cement industry in the near future. The world population is expected to grow from 7.6 to 9.7 billion people by the year 2050 — a growth of 22%. Of that growth, an additional 2.5 billion people are expected to live in cities, increasing the demand for solid urban infrastructure.

These changes in world population will directly impact the cement industry. Global cement demand is set to grow between 12 and 23% by 2050. And we can't ignore the need for green construction and de-carbonization. New investments and policy in place bolster the need to meet these global emissions targets in cement production.

# Operational challenges

and how they affect profitability



Source: IFC, Energystar.gov, Journal of Quality in Maintenance Engineering, ISA, KEMA



# The connected cement plant

turns data into business decisions

When you collect, aggregate and analyze data across operations, you can spot trends and interdependencies that are missed when data lives in silos. With this type of information, you can make more informed decisions.

**Connected workforce**  
Modern digital tools help deliver better insights and improve field experience

## Third-party integration



## Quarry to market visibility



## Remote expert support



**Knowledge-driven operations**  
Solutions that enable better decision-making

## Intelligent packaged power



## Process solutions



**Operational efficiency**  
Modern technologies improve performance of process, equipment, and people

## Smart devices



# Process solutions

## PlantPAx®: The modern DCS for cement applications

Cement producers have a lot to keep track of. Energy management, asset management and machine and process safety are just a few. PlantPAx DCS is the core system to help you achieve your production goals in a smart way, combining several disciplines in a unified system:

System architecture

Control and I/O

Networks and virtualization

Engineering

Operations

Field device integration

Asset management

Batch management

Information/Production intelligence

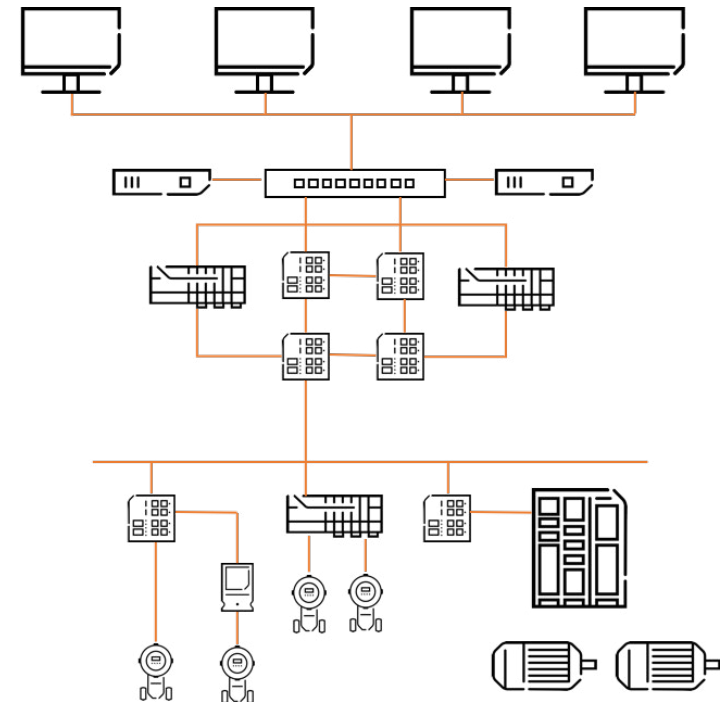
Machine safety

Process safety

Model predictive control

Cybersecurity

**PlantPAx®**  
Distributed Control System

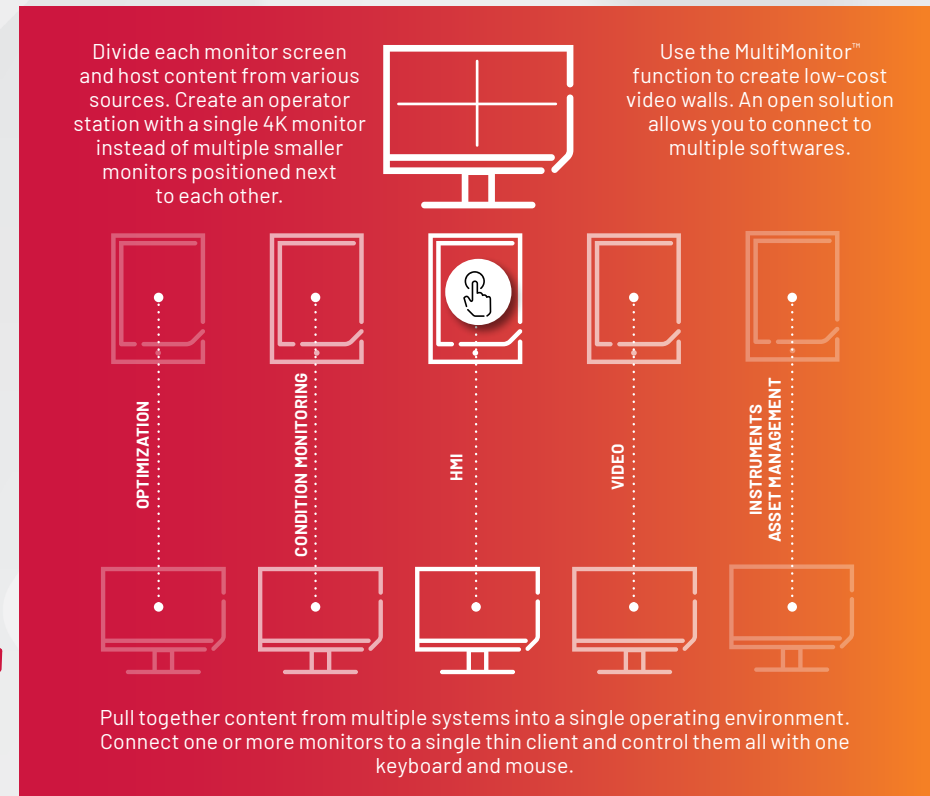
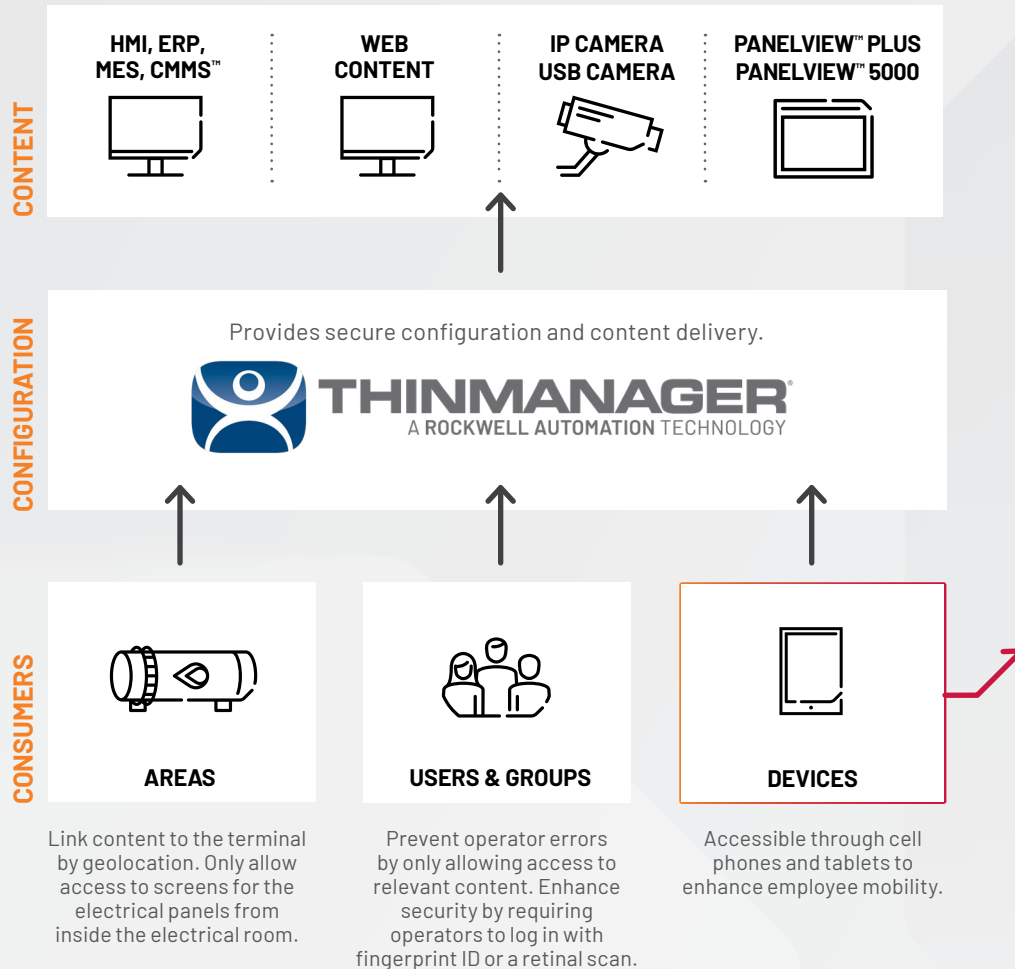


**<1%**

**of project capital cost**  
comes from the control  
system, but it is the core  
of your production

## SOLUTION AT A GLANCE

# Integrated visualization



# Process solutions

benefit each application  
area of your cement plant

# Cement plant control

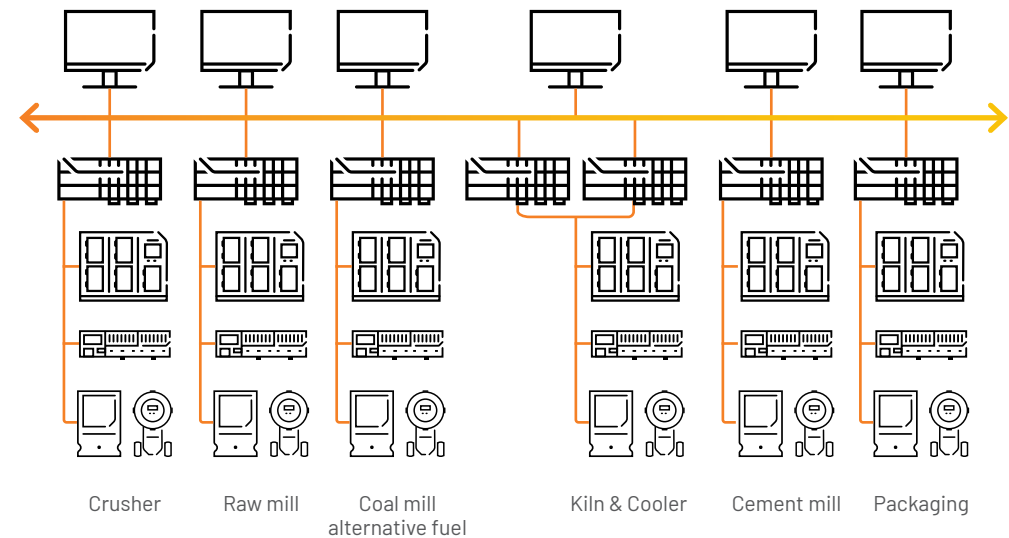
## High availability DCS for critical applications

An integrated process control system reduces engineering risks and facilitates smoother operations and simplified maintenance.

Our high availability and scalable DCS is a perfect fit for your cement operations. Its open technology means you can seamlessly integrate process information into your business systems from field instrumentation and third-party equipment.

**This means less risk and more productivity for your operations.**

**An integrated system reduces engineering risks and facilitates operations, maintenance and operational changes.**





# Model predictive control

Process stabilization, production quality, emissions reduction, energy efficiency



## UTILITIES

Reduce energy costs

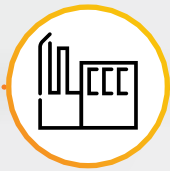
Manage use of  
alternative fuels



## MILLS

Reduce energy cost

Increase throughput  
Reduce sizing variability  
Improve product  
grade quality  
Smooth transitions  
between cement types



## MATERIAL BLENDING

Reduce blend  
variability  
Reduce blend costs  
Improve raw material  
resource usage  
Improve downstream  
performance



## PYROPROCESSING

Increase throughput  
Decrease product  
variability  
Reduce energy costs  
Improve product  
quality  
Reduce emissions  
Improve heat recovery  
Longer campaign run  
and refractory life



## ANALYTICS

Production metrics  
Production  
accounting  
Efficiency measures



## QUALITY

Software virtual  
analyzer  
Predicts quality or  
process variable



## ENVIRONMENTAL

Improve  
environmental  
compliance

# INDUSTRY-SPECIFIC PROCESS CONTROL FOR cement production



## EFFICIENT DESIGN AND OPERATION

**PlantPAx**<sup>®</sup>  
*Distributed Control System*



### Process automation and control

Integration between critical areas of your plant is essential to optimizing your cement plant. Our cement solution connects process, discrete, power, information and safety control into one plant-wide infrastructure. An integrated system reduces engineering risks and facilitates operations, maintenance and operational changes.

**Engineering and operations efficiency:** standards and libraries for the cement industry

We worked with leading cement companies to develop process libraries and functionalities to serve the cement industry. These tested libraries and functionalities enable faster commissioning, and provide opportunities to recognize operational efficiencies through robust standardization. All this adds up to cost savings for new plants and plant expansions.

# Improved operator situational awareness

Simple and more intuitive operation

Simplified color scheme for better operator awareness

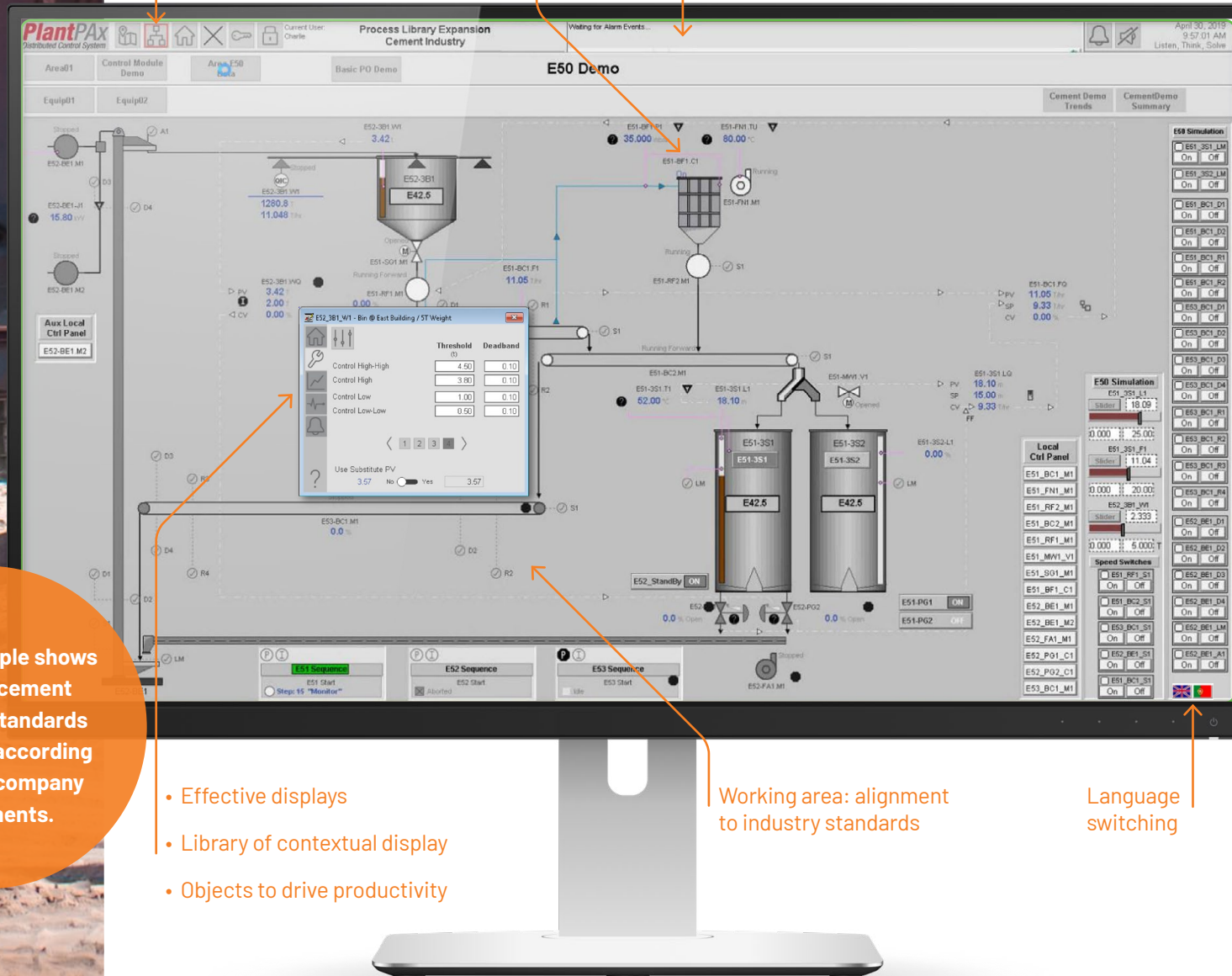
Intuitive alarm area

Screen example shows a specific cement customer. Standards can change according to specific company requirements.

- Effective displays
- Library of contextual display
- Objects to drive productivity

Working area: alignment to industry standards

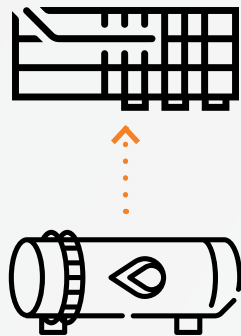
Language switching





# Objects to support cement processes

Enhanced or new logic instructions and faceplates



## Motor control

- Single-speed motor reversing motor
- Runtime and start counter
- Restart inhibit for large motor
- Two-speed motor
- VSD LV/MV PowerFlex® Drives
- Smart motor controller

## Valves

- Motor-operated valve
- Solenoid-operated valve
- Analog/pulsed control valve
- Two-state valve statistics

## Procedural control

- Sequencer object

## Cross-functional

- Speed switch support
- Interlocks by type
- Analog input channel with snap-band
- Advanced analog input with separate control limits
- Discrete two, three or four state device
- N - position device
- Command source with external enable via HMI

# Benefits from **system design to expansion**





# Process solutions

Solutions across the lifecycle

## design

Easy to design and configure  
Streamlined workflows  
Consistent project delivery

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## build

Easy to integrate

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## sustain

Operations and maintenance centric  
System-level decisions  
Safe and cybersecure

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## improve

Scalable  
Future-ready technology  
Analytics enabled

## Easy to design, configure and integrate

Save engineering costs and  
reduce commissioning hassles

- Characterized systems and validated architectures for optimal performance of the DCS servers, controllers and required memory.
- Speed and ease of programming and system configuration including preconfigured virtual templates and process libraries.
- Embedded process instructions reduce system footprint, drive consistent product delivery, and streamline workflows (reduce tasks and clicks).
- Premier integration with motor control and field instrumentation.
- Easy to integrate main processes with other OEMs (no data remapping).
- Reduce rework by simulating plant response – identify and mitigate operational problems before being brought online.



The average loss of revenue is **\$12,500 per hour** during an outage.

Source: Bricking Solutions

# Improve operations

Empower operators and reduce training costs

- Graphics focused on simplicity and situational awareness allow users to understand the state of equipment immediately.
- Real-time display of all process variables, alarms and trends provide up-to-date information. Integrated reporting tools convert data into information on a real-time basis.
- Multilingual support and multiple user modes cater to user roles.
- View need-to-know trends with optimized display of event information with real-time and historical data.
- Effective alarm management directs the operator's attention to their job.

# Improved maintenance

Maintain availability in critical areas

- High-availability servers, controls and networks and out-of-the-box diagnostics for system issues.
- Seamless visibility of devices for asset management, motor control and other instruments.
- Breadcrumbs highlight modules that are in an abnormal state and quickly determine what has been changed or needs attention.

To fully master the requirements, cement control room operators need 2-3 years of on-the-job training and practical experience.

Source: KFW DEG

**Variation in raw materials and fuels is likely to result in changes in kiln conditions and consequently, changes in the cement.**

## Enable decisions at the system level

Vast availability of in-chassis capabilities


- Artificial intelligence/machine learning
- Model predictive control
- Compute module (for custom applications)
- Embedded historian

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## Cybersecure

Enhances security and compliance with ISA99/IEC62443

- Certifications for product development
- Certifications for system components
- Validated system reference architectures
- Projects delivered by Rockwell Automation following process and certifications for cybersecurity

 In March 2019, one of the largest aluminum producers in the world experienced a crippling cyberattack by the LockerGoga malware. It paralyzed the company's computer networks, forcing it to isolate plants and switch some operations to manual.



A close-up photograph of an Allen-Bradley Logix5581ES industrial control unit. The unit is primarily grey with a red top section. It features a power switch, a digital display, and various status LEDs. A green Ethernet cable is plugged into the bottom. A yellow banner with the word 'IMPROVE' is overlaid on the top left.

IMPROVE

# Scalable

## Future-proof technologies

- Same system for process, equipment, large and small systems
- Easy to evolve and expand
- Open Ethernet IP uses standard open hardware/software network infrastructure
- Analytics-enabled solutions



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