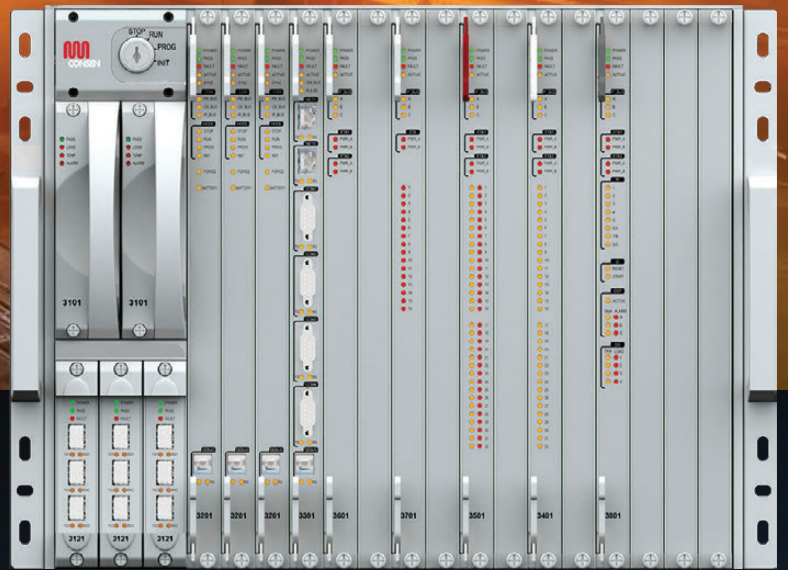




# TSxPlus

INDUSTRIAL CONTROLS SYSTEM



# BEIJING CONSEN TECHNOLOGIES COMPANY

a Subsidiary of China Automation Group Limited

Our headquarters were established in Beijing China in 1999. Since then we've been committed to designing, developing, and supplying ultra-reliable safety and critical process control products for the Energy, Chemical, and Power Industries.

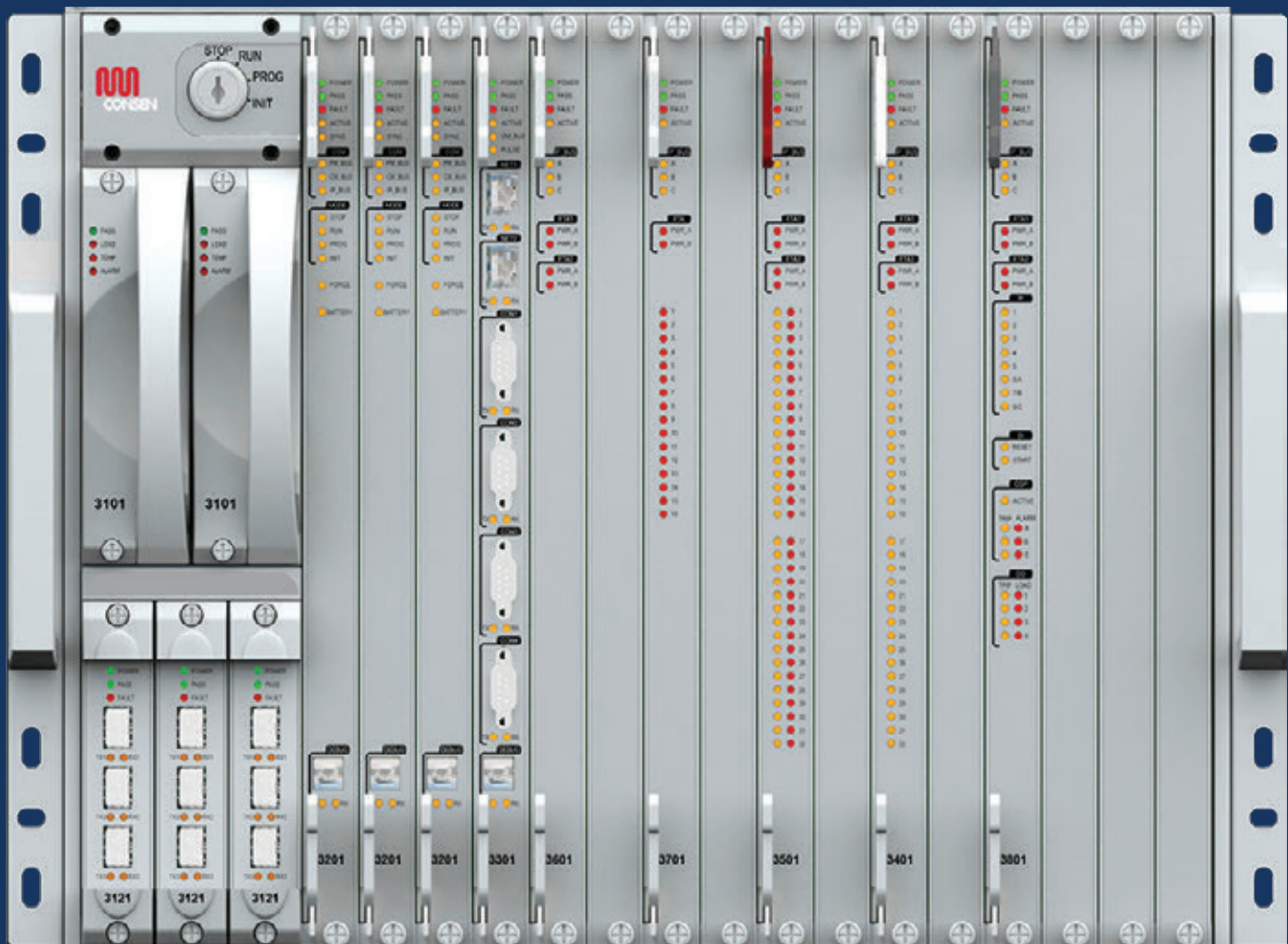
At Consen Technologies, 80% of our team are R&D engineers and 90% of them hold advanced degrees in either electrical engineering or software development.

With an approximate market share of 75%, China Automation Group Limited, is the largest integrated solutions provider of safety and critical control systems in China.

# PERFORMANCE, FLEXIBILITY, AND RELIABILITY

The Consen TSxPlus is a Triple Modular Redundant (TMR), SIL rated, critical controls system for industry.

TUV SIL 3 certified, with 99.9999% reliability, on-line repairability, next-generation processing performance, and practically unlimited scalability; the TSxPlus is perfect for critical industrial control applications.



The TSxPlus uses three identical channels. Each channel independently executes the control program in parallel with the other two channels. Specialized hardware/software voting mechanisms qualify and verify all digital inputs and outputs from the field, while analog inputs are subject to a mid-value selection process.

Because each channel is isolated from the others, no single-point failure in any channel can pass to another. If a hardware failure occurs on one channel, the other channels override it. Meanwhile, the faulting module can easily be removed and replaced, while the controller is online, without interrupting the process.

# PERFORMANCE, FLEXIBILITY, AND RELIABILITY



## Reliability

The probability that no system failure will have occurred in a given period. For the TSxPlus, this probability is 99.999%



## Availability

The probability that the control system is operational at some instance of time. Availability for the TSxPlus is 99.9999%



## Performance

5msec for program execution time, and 15msec loop response time (screw to screw).



## Flexibility

A TSxPlus system always has one main chassis and up to fourteen expansion chassis.



## Security

TUV and ISASecure EDSA compliance with the latest information and data security directives.



## Diagnostics

The TSxPlus provides real-time system status monitoring, processor execution time, memory usage, and version reporting.



## Software Suite

The Architect TSxPlus Software Suite includes a comprehensive set of industrial control and data management applications.

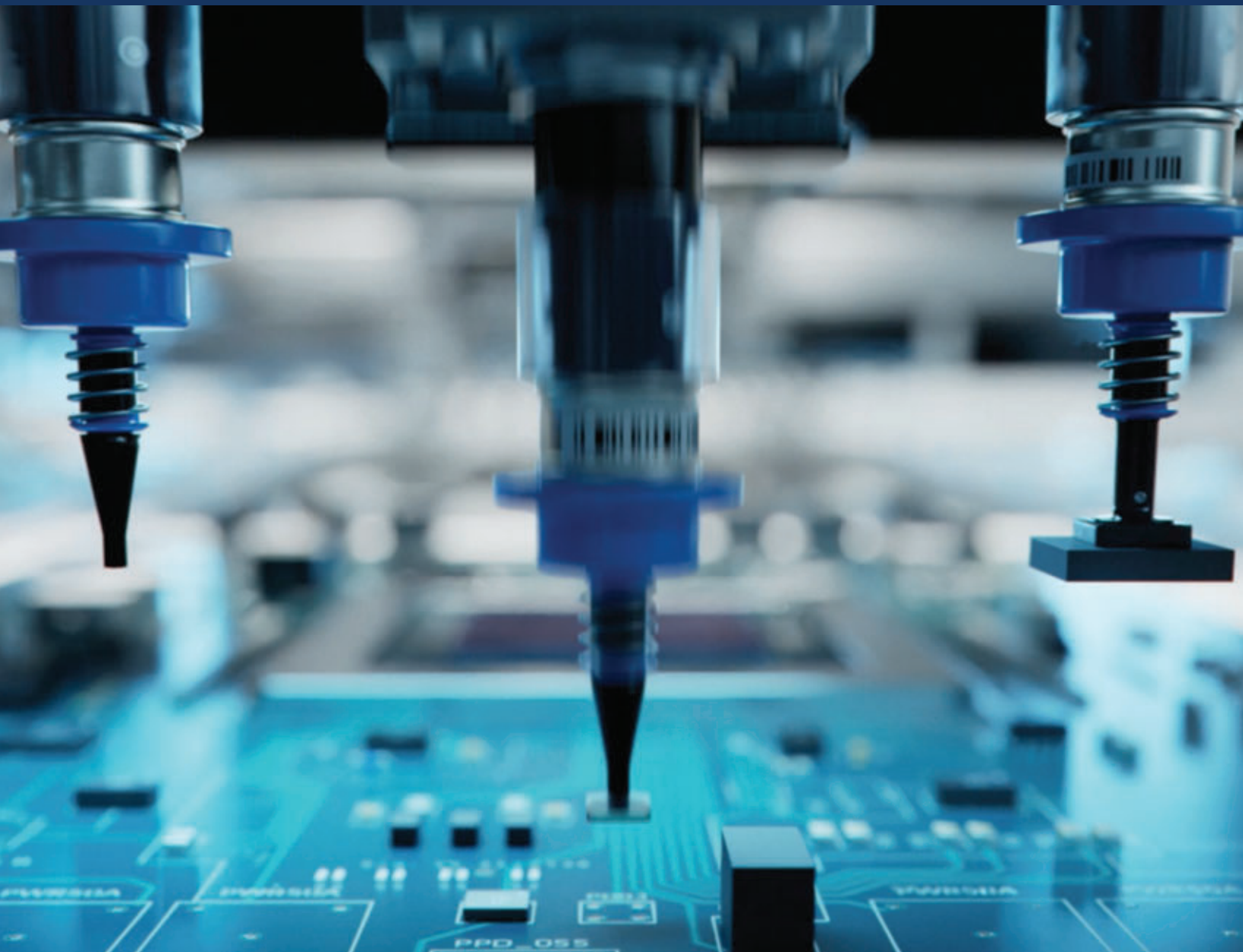


## Certification

In addition to TUV SIL 3 safety certification, the TSxPlus also includes "alphabet" international directives and standards compliance certification.

# HOW IT'S MADE

The TSxPlus is designed and engineered “in-house” at the Consen Technologies design and development center (a subsidiary of the China Automation Group). From specifications definition, product development, prototype, and final product testing, Consen Technologies provides world-class engineering and design expertise.



Fabrication, Assembly, and initial testing of the TSxPlus hardware are accomplished by manufacturing partners that have embraced and implemented the Industry 4.0 philosophy.

Industry 4.0 is revolutionizing the way companies manufacture products. Our Manufacturing partners have integrated technologies that include; Industrial Internet of Things (IIoT) connectivity, cloud computing and analytics, and AI and machine learning into their production facilities and throughout their operations.

In addition to ultra-precise “smart-tools,” employed by these state-of-the-art manufacturing facilities, their smart assembly lines are also equipped with advanced sensors, embedded software, and robotics that collect, store, and contextualize production data. Near real-time automatic and manual examination of this manufacturing data allows for unprecedented insights that lead to better manufacturing decision-making and execution.

All of this, leads to the building of TSxPlus chassis', modules, and assemblies with world-class dependability and reliability .

# HOW IT'S MADE

## Industry 4.0



*Fabrication, assembly, and initial testing of the TSxPlus hardware is provided by manufacturing partners that have implemented Industry 4.0 philosophy.*

# HOW IT'S MADE

## Smart Assembly

*Smart assembly lines are equipped with robots using advanced sensors, embedded software, IIoT connectivity, and AI machine learning.*

# HOW IT'S MADE

## Smart Testing

*Testing for very TSxPlus assembly (module, power supply, chassis, etc.) includes both automatic and manual functional verification prior to shipment.*



# HOW IT'S MADE

## Production Insights

*Near real-time automatic and manual examination of the production data collected by smart robots provides insights that lead to better manufacturing execution.*

# WHERE IT'S USED

The TSxPlus is used globally in critical Chemical, Energy, and Power applications that include; Emergency Safety Shutdown, Fire and Gas Protection, Turbomachinery Control, and Boiler Protection and Control.



# WHERE IT'S USED

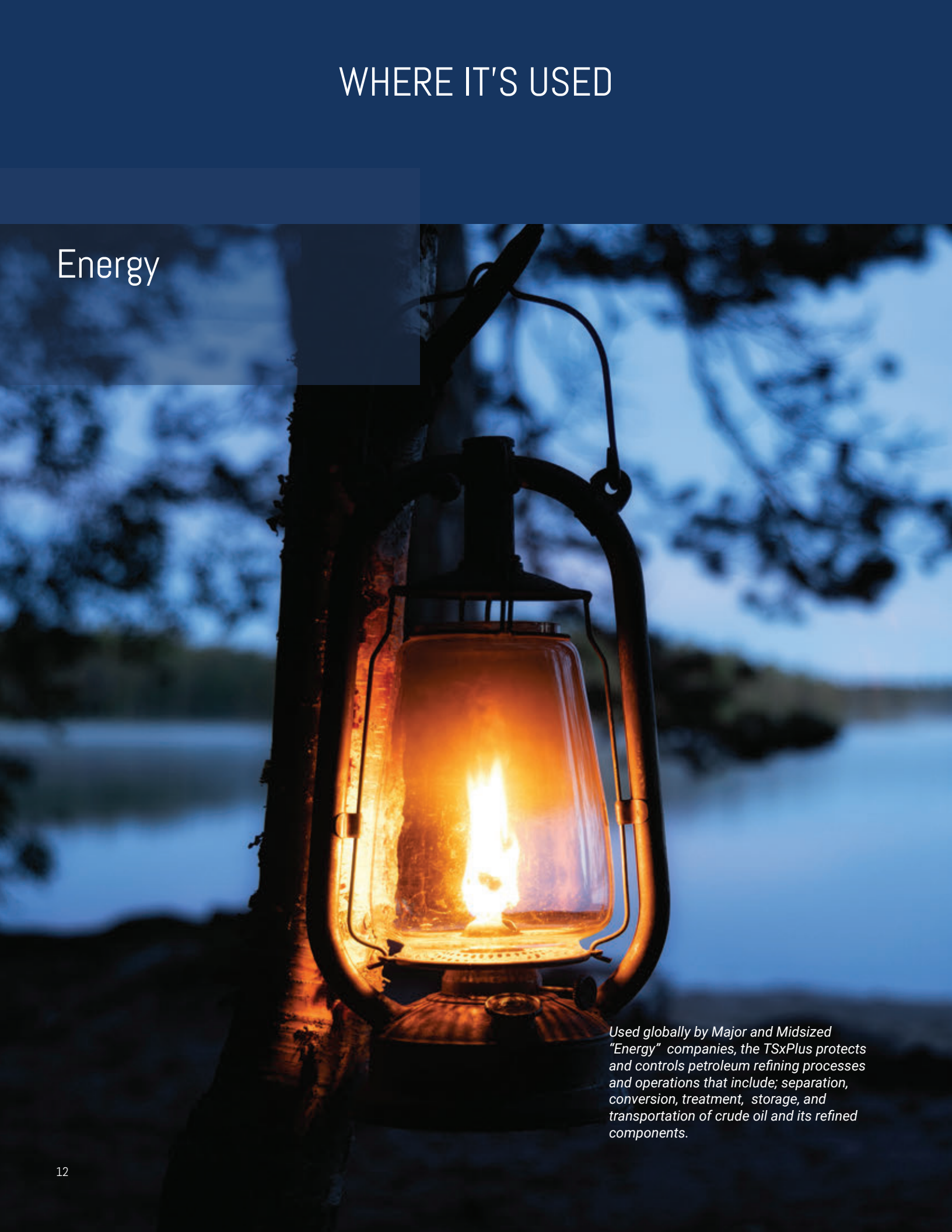
## Chemicals



*The TSxPlus is used in the International Chemical and Petrochemical Industries to protect and control both "commodity chemical" production processes - polymers [PE, PVC, etc.], ethylene, propylene, acrylics, etc. - as well as "specialty" chemical production processes including; industrial gases, adhesives, sealants, etc.*

# WHERE IT'S USED

Energy

A glowing lantern hanging from a tree branch at dusk, symbolizing energy. The lantern is the central focus, emitting a warm, golden light that illuminates the surrounding branches and the darkening sky. The background shows a blurred landscape with trees and a body of water under a twilight sky.

*Used globally by Major and Midsized "Energy" companies, the TSxPlus protects and controls petroleum refining processes and operations that include; separation, conversion, treatment, storage, and transportation of crude oil and its refined components.*

# WHERE IT'S USED

Power

*Controlling and protecting turbines, generators, and auxiliaries, the TSx Plus is at home in both Coal and Nuclear Grid Power applications including conventional and cogeneration (CHP), topping and bottoming cycles, base load, peak load, as well as Captive Power applications.*

# WHERE IT'S USED

*The TSxPlus provides continuous protection for safety-critical units in refineries, petrochemical/chemical plants, and other industrial processes.*

*When applied as a Fire and Gas Protection system, the TSxPlus continuously monitors for abnormal situations such as a fire or combustible or toxic gas release within the plant; and provides early warning and mitigation actions to prevent escalation of the incident and protect the process or environment.*

## Emergency Safety Shutdown (ESD)



## Fire and Gas Protection



# WHERE IT'S USED

## Turbomachinery Controls

*With "rotating machinery" specific pluggable I/O modules like the Overspeed Protection module, Servo Controller module, and Vibration Interface module, the TSxPlus is uniquely suited - and used extensively - for critical turbomachinery control applications in the oil and gas, power, refining, and chemicals industries.*

## Boiler Protection and Control

*Steam boilers function as a critical component in most refinery applications, many chemicals-related processes, and power generation.*

*The TSxPlus combines the protection of the boiler from upset conditions, safety interlocks for normal startup and shutdown, and flame-safety applications into one integrated control platform.*



The TSxPlus is used in the International Chemical and Petrochemical Industries to protect and control both "commodity chemical" production processes as well as "specialty" chemical production processes.

The TSxPlus is also used by Major and Midsized "Energy" companies, to control and protect petroleum refining processes and operations that include; separation, conversion, treatment, storage, and transportation of crude oil and its refined components.

In addition to providing critical control and protection for the Chemical and Energy Industries, the TSx Plus is equally at home providing protection and control in both Coal and Nuclear Grid Power applications, including conventional and cogeneration (CHP), topping and bottoming cycles, base load, peak load, as well as Captive Power applications.

## WHO USES IT

Some companies that use the TSxPlus for their critical control and safety applications.

