SCEPTRE INTEGRATED SOLUTIONS

CASE STUDY: AI-ENABLED HVAC & CRITICAL COOLING PERFORMANCE MANAGEMENT

Technology-Enabled Industrial Services Platform

OVERVIEW

Industry Application: Oil & Gas Production Facilities

Solution: SIS AI-Enabled Critical Cooling Reliability & Performance Solution

Key Benefits:

- Predictive Maintenance (AI-driven)
- Reduced Unplanned Downtime
- Energy Optimization (5–15%)
- Improved Asset Reliability
- Real-Time Remote Monitoring

Fluid chiller systems are critical to maintaining safe, stable, and continuous operations across process facilities, control rooms, Local Equipment Rooms (LERs), and other mission-critical environments. Failure of these systems can directly impact operational continuity, asset integrity, and production performance.

However, the client's existing maintenance approach was largely reactive in nature, combined with limited real-time performance visibility, which significantly constrained the ability to proactively identify and mitigate developing issues. As a result, the fluid chiller systems were exposed to an increased risk of unplanned failures, which can have wide-reaching operational and financial consequences.

OPERATIONAL & BUSINESS IMPACT

Failure of a critical fluid chiller system can have significant operational, safety, and commercial consequences, including:

- Loss of HVAC cooling to critical operational areas such as LERs, control rooms, electrical rooms, and instrumentation system
- Process interruptions, production deferment, and reduced asset availability
- Increased risk of overheating and failure of sensitive equipment
- Emergency maintenance interventions requiring rapid mobilization of personnel and materials
- Increased loading of standby systems, reducing overall facility resilience

COMMERCIAL IMPACT

- Direct repair costs typically ranging from $20,000–$100,000 per major failure, particularly where critical components require replacement
- Indirect costs associated with production losses, operational disruption, and reduced equipment availability
- Increased maintenance expenditure through reactive interventions and emergency call-outs
- Potential safety, environmental, and reputational impacts resulting from loss of critical cooling capability

WHY CHANGE WAS REQUIRED

The absence of real-time condition monitoring, predictive analytics, and proactive maintenance planning was introducing unnecessary risk to both operational continuity and asset integrity. A more intelligent, data-driven approach was required to improve reliability, optimize maintenance activities, reduce lifecycle costs, and improve overall facility performance.

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CHALLENGES

- Limited visibility of chiller performance
- No real-time visibility of chiller performance
- Delayed identification of faults (e.g. high discharge pressure, low suction)
- Reactive maintenance leading to compressor failures
- Inefficient communication between site and maintenance teams
- No predictive insights into component degradation (compressor, TXV, pumps)
- Energy inefficiency due to suboptimal operation (over-condensing, cycling)

SIS AI-ENABLED CRITICAL COOLING PLATFORM

SIS combines Industrial IoT, predictive analytics, maintenance automation, and engineering expertise to transform critical cooling systems from reactive maintenance models to predictive, performance-driven operations.

SIS SOLUTION COMPONENTS

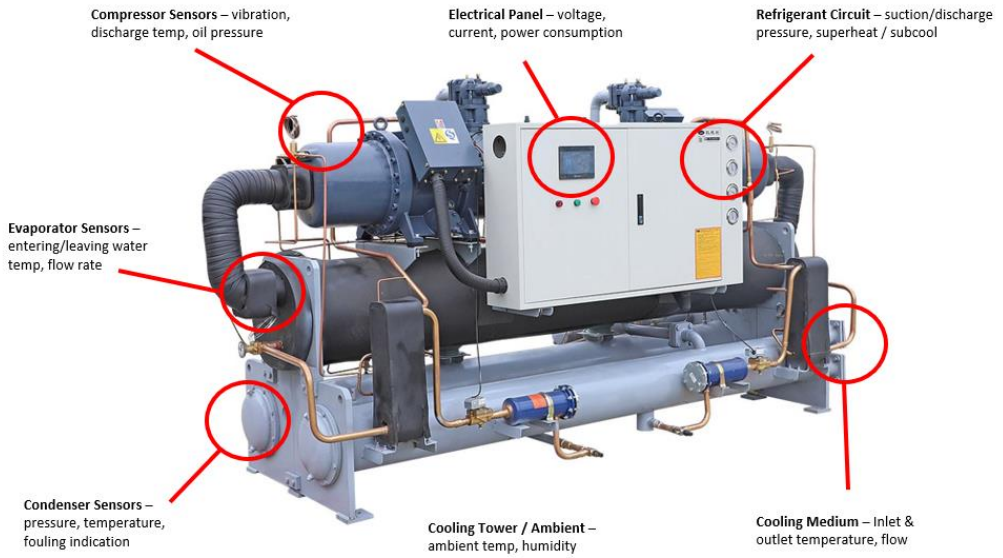
Real-Time IoT Integration
- Temperature, Pressure & Flow Monitoring
- Compressor Runtime & Status Tracking
- Pump Performance Analytics

AI Predictive Analytics
- Compressor Wear Detection
- Heat Exchanger Fouling Identification
- Failure Prediction & Early Warning

Automated Maintenance Triggers
- Condition-Based Alerts
- CMMS Integration (SAP / Maximo)
- Automated Work Orders

Remote Monitoring Dashboard
- Multi-Site Asset Visibility
- Trend & Performance Analytics
- Anomaly Detection

Energy Optimization Algorithms
- Optimize condenser fan operation
- Prevent over-condensing in winter
- Improve COP efficiency



- Reduced Downtime
- Improved Reliability
- Operational Visibility
- Predictive Maintenance
- Energy Optimization

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TYPICAL PERFORMANCE IMPROVEMENTS

IMPROVED RELIABILITY

↓ 30–50% reduction in critical failures

REDUCED DOWNTIME

↓ 25–40% reduction in unplanned outages

ENERGY SAVINGS

↓ 5–15% reduction in power consumption

PREDICTIVE MAINTENANCE

From reactive → condition-based strategy

IMPROVED SAFETY

Reduced risk of HVAC failure in critical zones

OEM PARTNERS

Carrier · SIEMENS · Honeywell · Allen-Bradley · EMERSON · Schneider Electric · Schneider Electric

SIS VALUE DELIVERED

SIS transforms critical cooling operations through real-time equipment monitoring, predictive analytics, and automated maintenance workflows. By providing earlier visibility of equipment degradation and emerging failure risks, SIS enables operators to improve system reliability, reduce unplanned downtime, optimize energy consumption, and lower maintenance costs.

FUNCTIONALITY

- Automated data capture (no manual logging)
- AI-driven fault diagnostics
- Maintenance automation workflows
- Real-time KPI Monitoring
- Performance analytics
- Digital Twin ready

ENGINEERING-LED APPROACH

SIS combines reliability engineering, predictive analytics, operational technology, and maintenance expertise to improve critical cooling system performance, reduce operational risk, optimize energy efficiency, and enhance asset reliability.