



**ENGINEER
NEXT**

NIDays

The logo features the text "ENGINEER NEXT" in a bold, white, sans-serif font, tilted at an angle. A yellow graphic element, resembling a stylized 'N' or a folded ribbon, is positioned between the words. Below this, the word "NIDays" is written in a smaller, white, sans-serif font, enclosed within a white rectangular border. The entire logo is set against a background of diagonal stripes in various shades of blue, green, and orange.

Monitoraggio Remoto di Sistemi Pompanti

Smart Monitoring per l'industria 4.0

Marco Lombardo

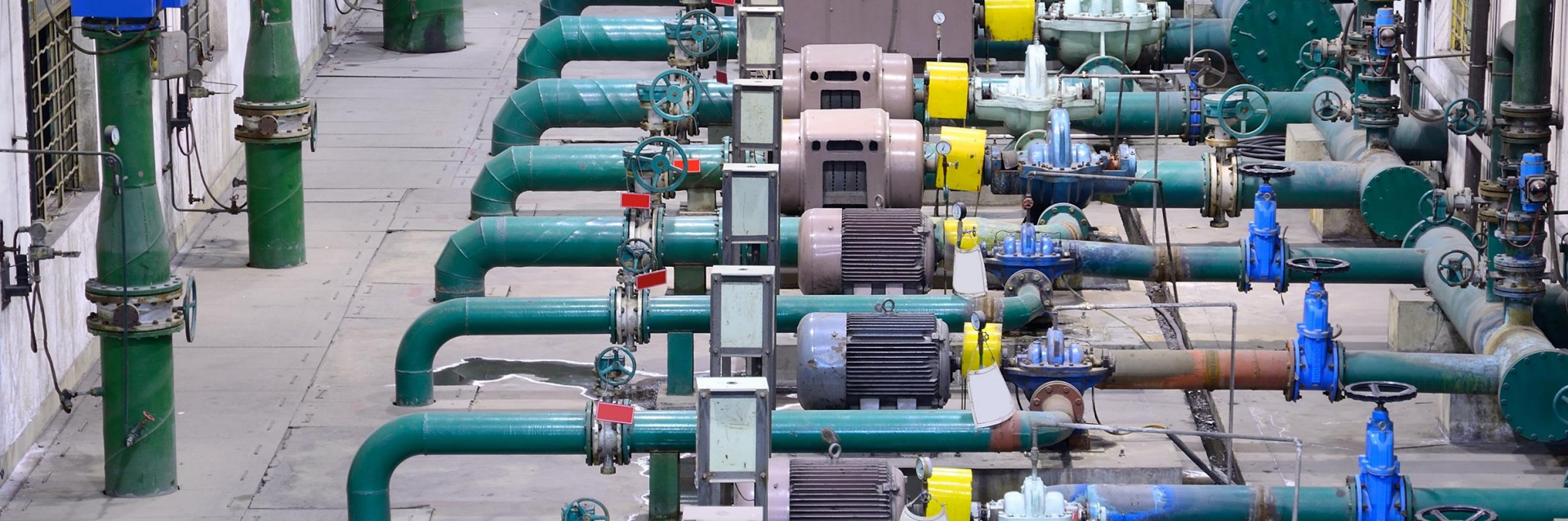
Claudio Cupini

TM.P. S.p.A. – Termomeccanica Pompe
Service Sales Manager Italia

National Instruments Italy
Field Marketing Engineer

Agenda

- Soluzioni NI per l'Online Condition Monitoring
- Chi è Termomeccanica?
- Pompa Centrifuga: caratteristiche, funzionamento e diagnostica
- Edge monitoring: la soluzione TMP Cyclop per il monitoraggio remoto
- Casi applicativi e sviluppi futuri



“Global processing industries have reported losing \$20 billion (USD) each year (or nearly 5 percent of their total production) due to unscheduled downtime; 80 percent of those losses are preventable.”

—ARC Advisory Group

“Ninety-five percent of business leaders expect their company to use the IIoT within the next three years, and 87 percent believe that it will contribute to long-term job growth.”

—Accenture



Test Assets

- ATE
- HALT chambers
- Test cells



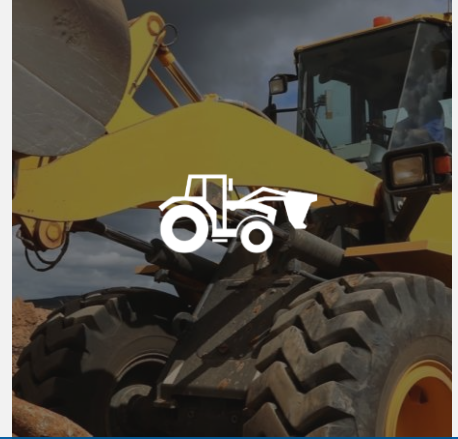
Production Equipment

- Part-handling machines
- Packaging machines
- CNC and tooling



Operational Assets

- Pumps and motors
- Turbines
- Grid devices



Transportation and Heavy Equipment

- Tractors and combines
- Earth movers
- Rail

The “Things” of the Industrial IoT



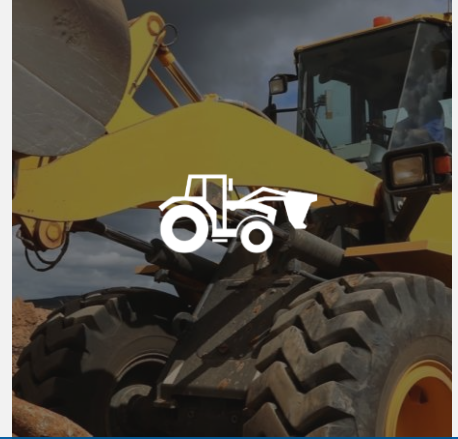
Test Assets



Production Equipment



Operational Assets

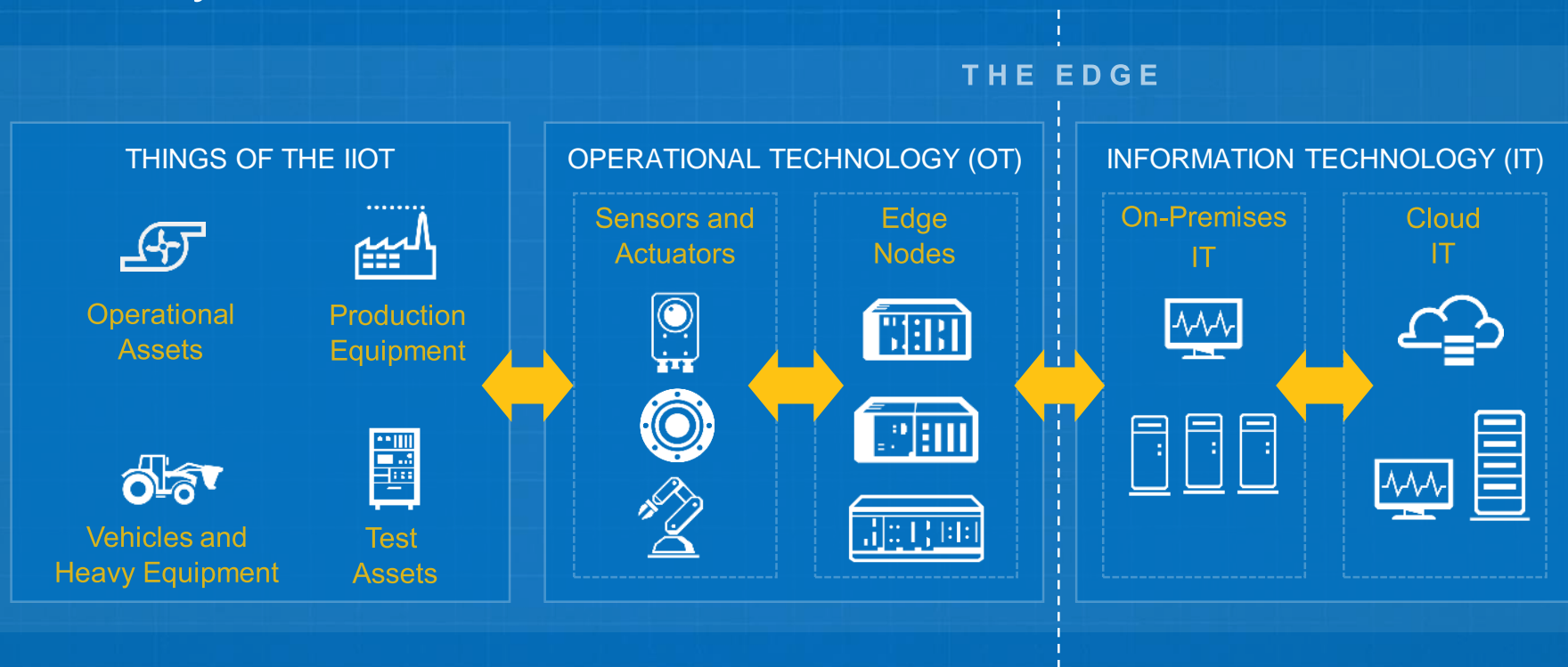


Transportation and Heavy Equipment

← INCREASED UPTIME WITH PREDICTIVE MAINTENANCE →

The Benefits of the Industrial IoT

IIoT System Architecture



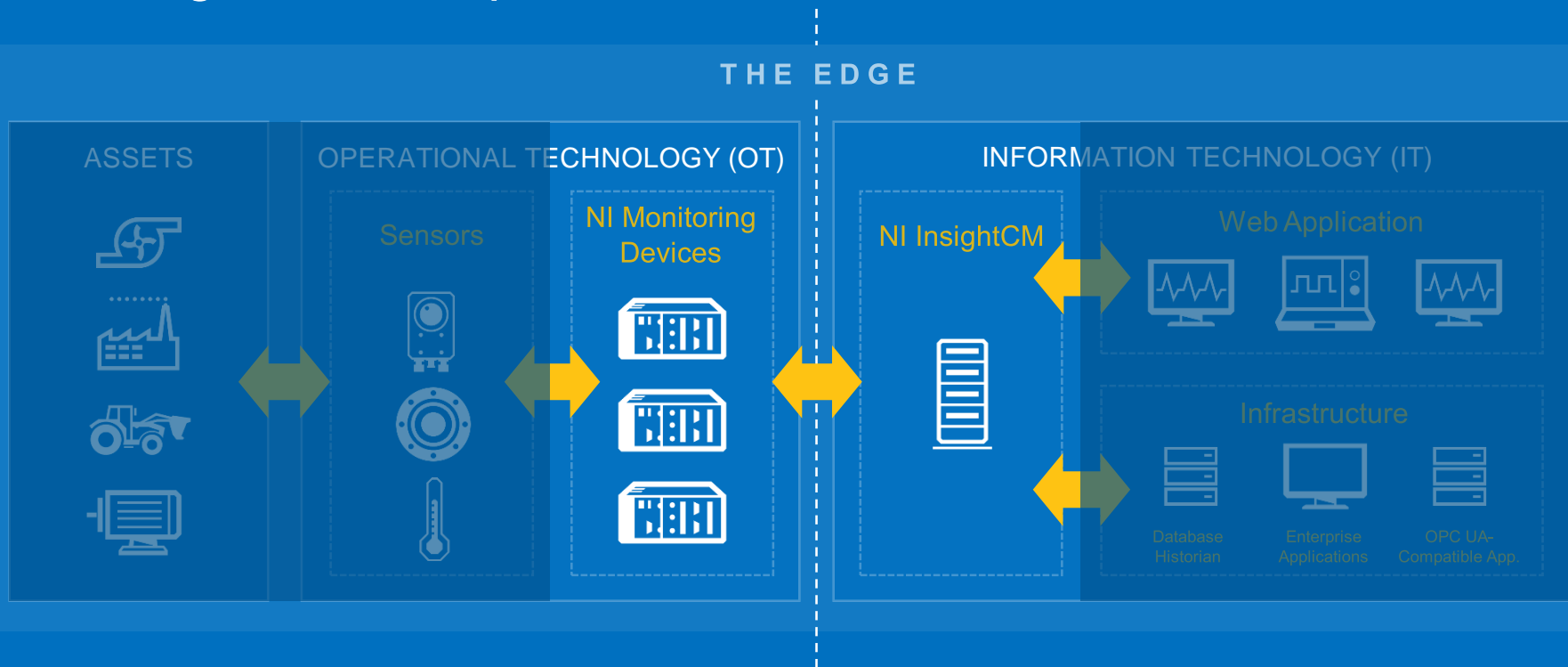
NI InsightCM™

Configuration-based tools tailored for online monitoring applications

- Configuration-based acquisition and data management tools
- Wide range of dynamic waveform and static sensor input options
- Data storage and visualization
- Complete accessibility to data
- Connectivity to third-party systems and analytics via LabVIEW



NI InsightCM Components



NI Monitoring Devices

Integrated sensor measurements, analytics, data storage, and alarming



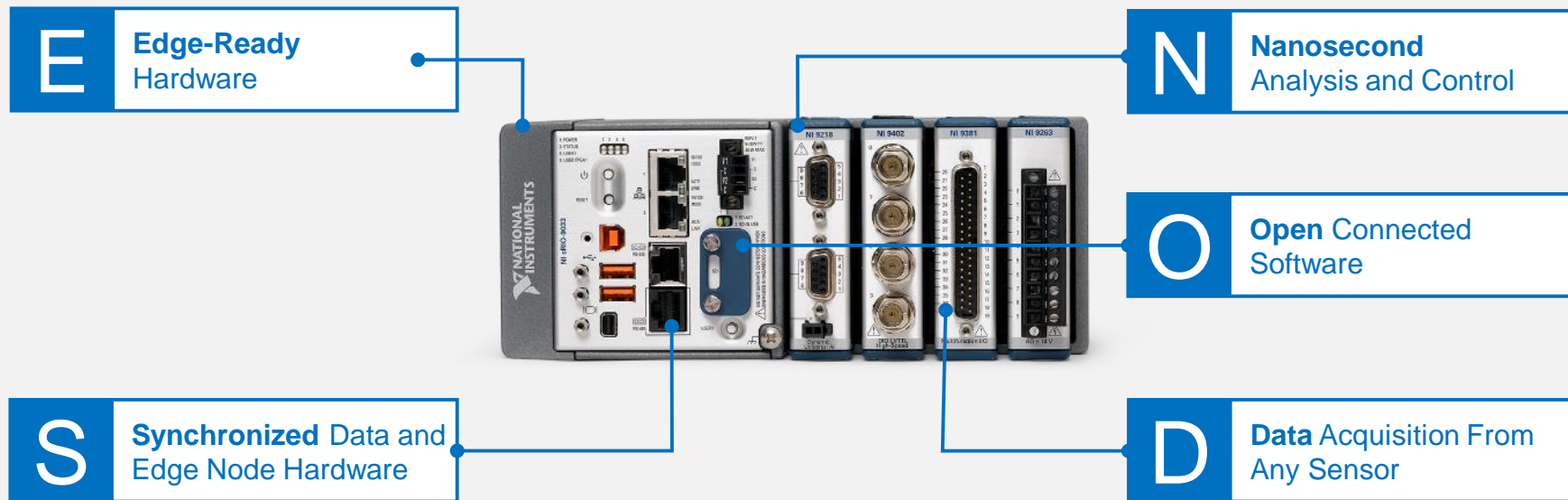
Vibration and Process

Electrical with MCSA
(Motor Current Signature Analysis)

Native sensor support:

- Accelerometers
- Velometers
- Proximity Probes
- Tachometers
- Current Transducer
- Potential Transducer
- Static voltage
- Static current (4-20 mA)
- RTD
- Thermocouple
- Digital input
- Modbus

The NI Edge Node Advantage



NI InsightCM™ Software

Configuration-based data acquisition, storage, and visualization tools

Systems management
tools

Remote access with no
client install

Alarm management tools

Asset-centric
configuration experience

Deployment-ready
software

Protect system with
permissions

Historian communication

Data management &
viewers

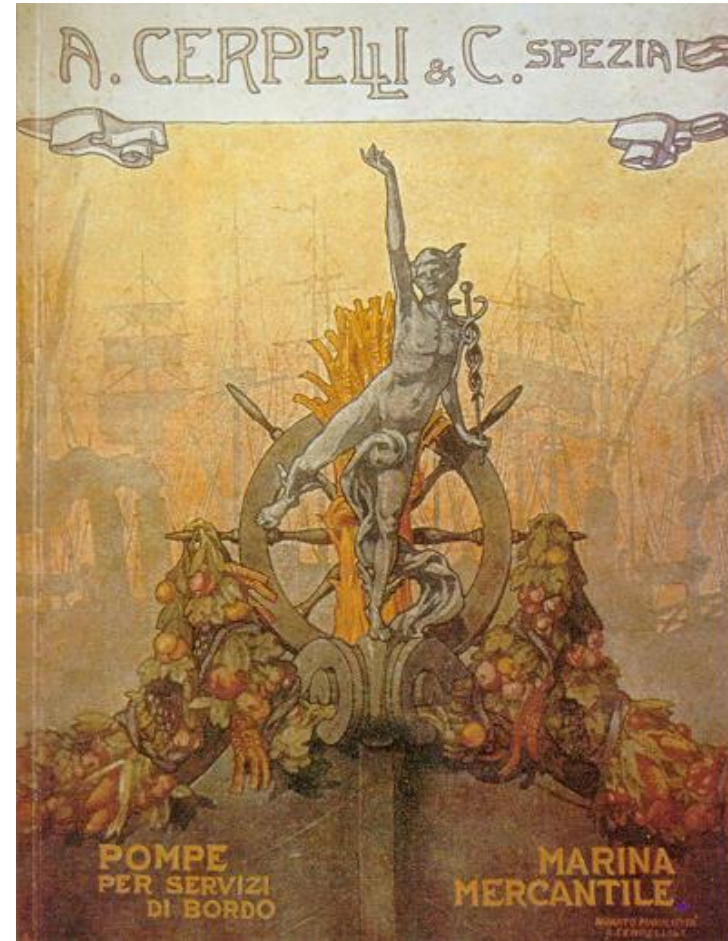


Termomeccanica Pompe

Termomeccanica

Una realtà italiana da oltre 100 anni

- 1912: Fondata A. CerPELLi & C.
- 1934: Nascita Società per Azioni (S.p.A.)
Termomeccanica Italiana
- 1981: Ingresso gruppo *EFIM*
- 1992: Dissoluzione *EFIM*
- 1995: Privatizzazione: *Termomeccanica SpA*
- 1999: Costituzione di: *TM.P. SpA*



Termomeccanica – Businesses

Mechanical Business



TMP

Pompe Ingegnerizzate
Compressori centrifughi e a vite
Global Service



ADICOMP

Compressori
Package di compressione

Environmental Business



TME

Ingengeria e realizzazione di impianti:
- Trattamento Acque
- Termovalorizzatori
- Energie rinnovabili



TMIP

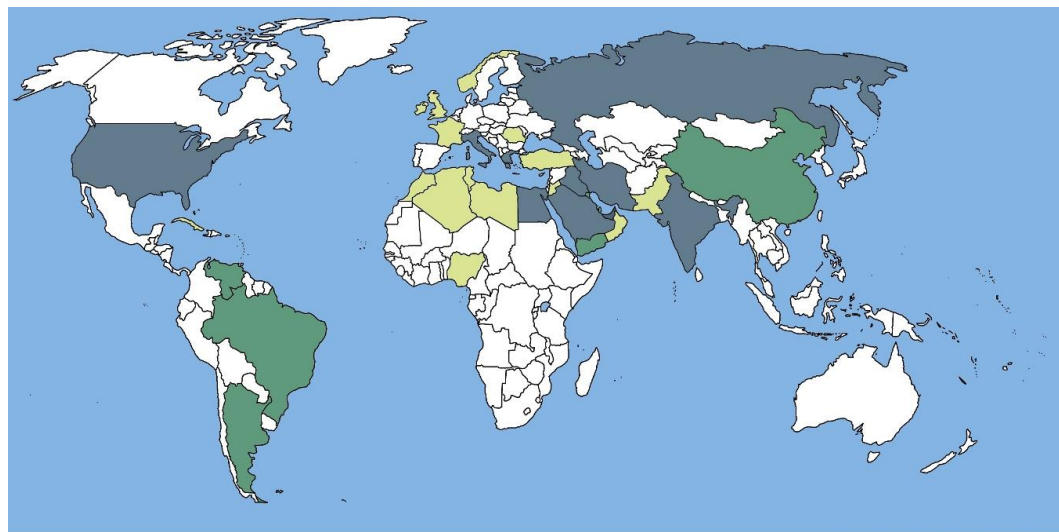
Impianti processi Petrolchimici



Termomeccanica

Mercati di riferimento

- Energia
- Dissalazione
- Oil & Gas
- Trasporto acqua



Termomeccanica

Localizzazione

Production Companies



Termomeccanica Pompe

- Total area: 50,000m²
- Covered area: 26,000m²



ADICOMP Srl (Vicenza – It)

- Total area: 5,000m²
- Covered area: 2,800m²



Transneft Oil Pumps (Chelyabinsk– Russia)

- Total area: 23,000m²
- Factory: 15,000m²
- of which test center 3,800m²

Service Companies



Termomeccanica Service Sud (Taranto - It)

- Total area: 4,500m²
- Covered area: 2,000m²



Termomeccanica Saudia Co. Ltd (Al Jubail Workshop)

- Total area: 4,000m²
- Covered area: 1,500m²



Termomeccanica Pompe Middle East FZE (Dubai - UAE)

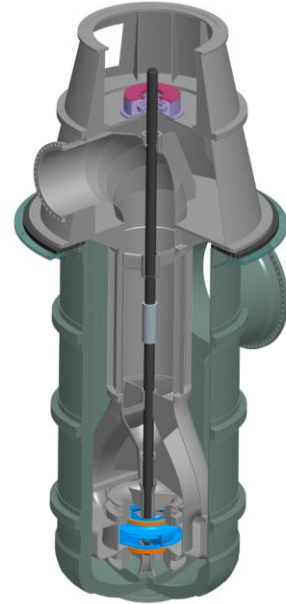
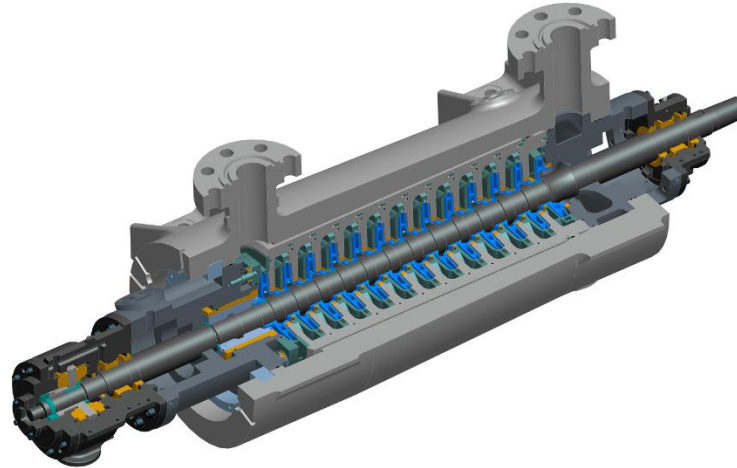
Currently = commercial office.
Service company with workshop to be set up in the short term

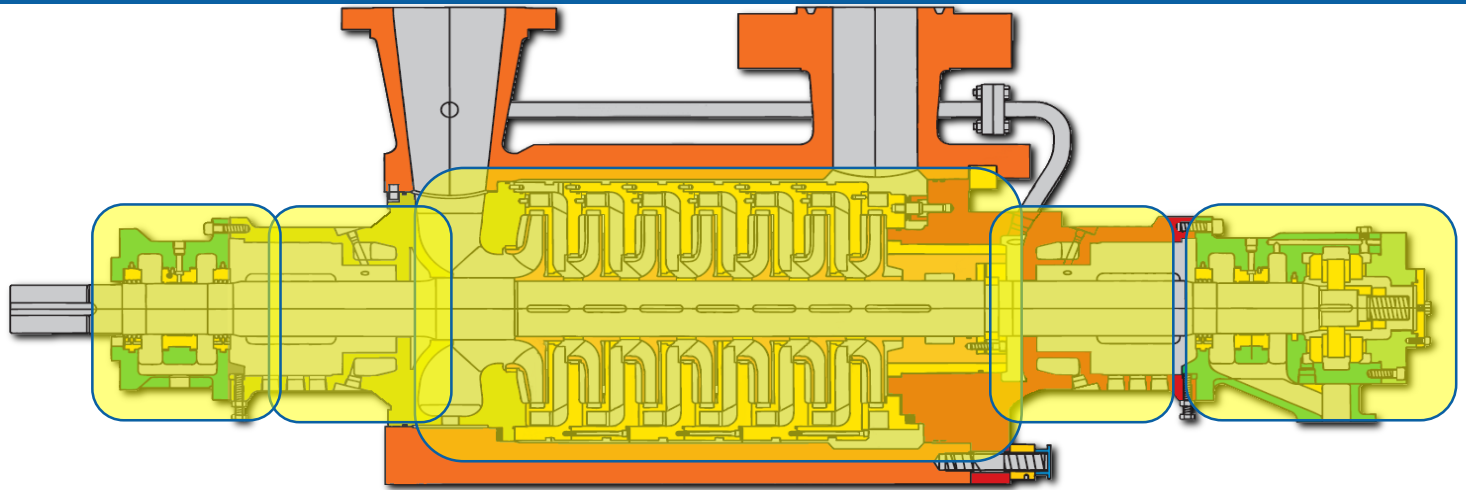
Prodotto: Pompa Centrifuga

Caratteristiche

Macchina in grado di convertire l'energia meccanica (del rotore) in energia cinetica e di pressione

- Moto Rotatorio
- Azionamento
- Rotore centrale
- Supporti di guida e spinta
- Accoppiamenti precisi





Prodotto: Pompa Centrifuga

Caratteristiche

- Rotore centrale con accoppiamenti precisi
- Tenute esterne
- Cuscinetti di supporto del rotore

Prodotto: Pompa Centrifuga

Controllo e strumentazione

- Controllo del processo
 - Pressioni
 - Portate
 - Temperature
 - Livelli
- Controllo dello stato
 - Temperature
 - Pressioni
 - Livelli
 - Vibrazioni

Prodotto: Pompa Centrifuga

Filosofie Manutentive

Manutenzione Preventiva

- Ore funzionamento
 - + Facile Implementazione (tempo)
 - + Programmabile nel tempo
- Riduce disponibilità operativa
- Costosa
- Non considera il reale stato macchina

Manutenzione Predittiva

- Stato macchina
 - Richiede interventi periodici di analisi
 - Necessita di gestioni flessibili
- + Riduce i tempi di intervento
- + Aumenta notevolmente la disponibilità operativa
- + Previene i problemi
- + Riduce i costi

Prodotto: Pompa Centrifuga

Diagnostica

- Intervento in campo
- Analisi dello stato puntuale
- Vibrazioni e analisi degli spettri
- Sistemi evoluti controllo (temperature)



La soluzione Cyclop di Termomeccanica

TMP Cyclop

TMP Divisione Service

- Forniture macchine e ricambi
- Modifiche, upgrading e efficientamento energetico
- Assistenza e manutenzione
- Reverse engineering
- **Diagnostica e analisi**
- Training del personale



TMP Cyclop

Sistema di monitoraggio remoto

- Controllo Stato macchine
- Analisi in tempo reale
- Analisi dati e trend temporali
- Supporto esperto

Data from Pump, Electric Motor, Steam Turbine (Pressure, Temperature, Vibrations, Process Flow)



Site



Technician



Acquisition & Processing System

Transfer of Data/Information



Data Center

Periodic Report
Anomaly Alerts



Storage & Display

Analysis



TMP Cyclop

La Soluzione

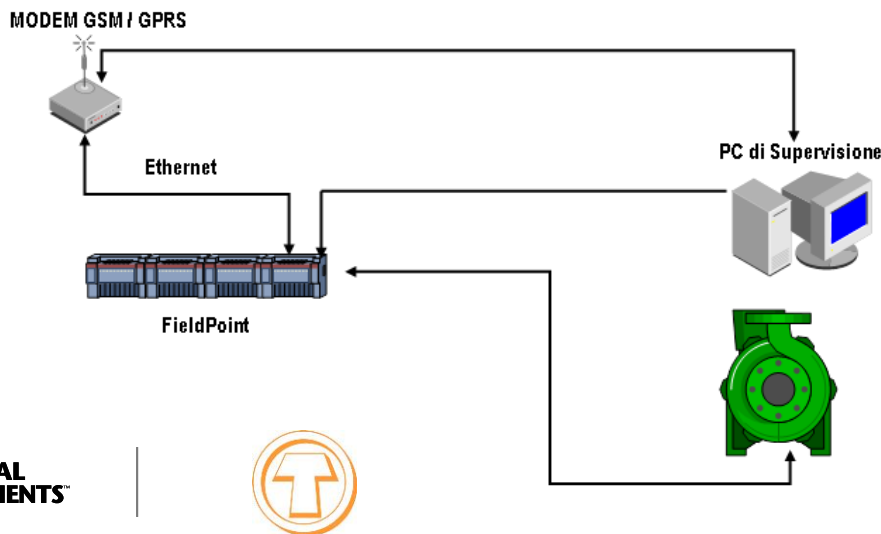
- Sistema integrato per la misurazione e analisi parametri macchina
- Analisi di tutti i parametri (stato e processo)
- Supporto del produttore
- Soluzione integrata per la manutenzione



TMP Cyclop

Le origini 1/2

- Disponibilità reti dati
- Raccolta dati in tempo reale
- Storage point to point con PC nella sede TMP
- Possibilità di visualizzare i dati e il loro trend
- Dati statici



TMP Cyclop

Le origini 2/2

- Hardware NI
- Programmazione LabVIEW
- No recovery
- No indicizzazione
- Reti costose

NI FP-2015, NI FP-2010, NI FP-2000

Controller Overview

- Real-time LabVIEW embedded controllers for intelligent industrial I/O
- Operates as stand-alone embedded real-time controller or PC-based distributed I/O Ethernet interface
- Industrial-grade reliability
 - Automatic self-diagnostics
 - Redundant power supply inputs
 - Isolated communication bus to I/O modules
- RS-232 serial port for local device control

Operating Systems

- Windows 2000/NT/XP/Me/9x
- Real-time performance with LabVIEW

Recommended Software

- LabVIEW
- LabVIEW Real-Time Module
- LabVIEW Datalogging and Supervisory Control Module

Other Compatible Software

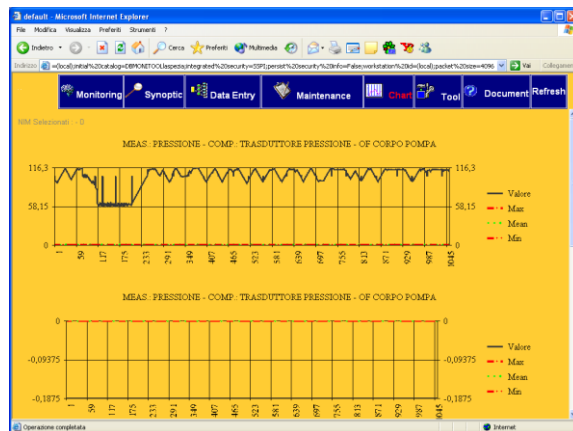
- LabWindows/CVI
- Measurement Studio
- Lookout
- VI Logger

Driver Software (included)

- Measurement & Automation Explorer
- OPC server (2.0 compliant)



Field out Real-Time Ethernet Controller Interfaces



CYCLOPS SYSTEM - REMOTE DATA

READY

27/05/02 11:37



TM.P. S.p.A. Termomeccanica Pompe Advanced Pumps Technology



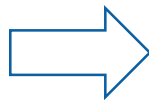
REMOTE STATION
DETAILS [F1]

GET SMS [F2]

VIEW CURVES [F3]

INFO [F11]

EXIT [Esc]



TMP Cyclop

L'evoluzione

Sistema originale

- Hardware non configurabile
- Solo segnali in corrente 4-20mA
- Archiviazione e Allarmi sui segnali
- Invio di allarmi o streaming di dati
- Strumenti di analisi diagnostiche limitate

Nuovo sistema

- Hardware configurabile
- Schede di acquisizione specifiche per ogni tipo di segnale
- Archiviazione e allarmi su segnali ed elaborazioni dei segnali
- Invio di allarmi o streaming di dati
- Interfaccia PC diretta per analisi veloci
- Potenziale strumento di controllo (sostituisce il PLC)

Cyclop 2.0

Caratteristiche del progetto

- Sviluppo di un sistema qualificato
- Collaborazione con NI
- Capace di interagire con IIoT e Industria 4.0
- Mantenere le stesse potenzialità di acquisizione
- Espandere le possibilità di assistenza



Cyclop 2.0

Processo 1/2

- Completo set di sensori dedicati
- Collegamenti a bordo macchina con sistema di acquisizione
- Sistema acquisizione ultima generazione espandibile e modulabile
- Collegamento con Web mediante sistema indipendente di trasmissione
- Connessione protetta

Pompa installata



Trasmissione dati



Sistema Acquisizione



TM.P. Cyclop Server

Cyclop 2.0

Processo 2/2

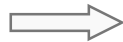
- Server presso TMP
- Software dedicato
- Supporto esperto
- Integrazione con manualistica e sistemi di reporting

Pompa installata

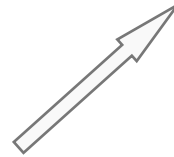


Sistema Acquisizione

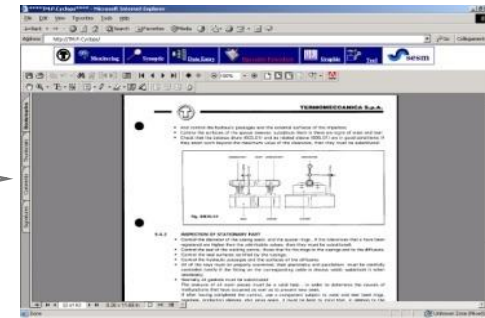
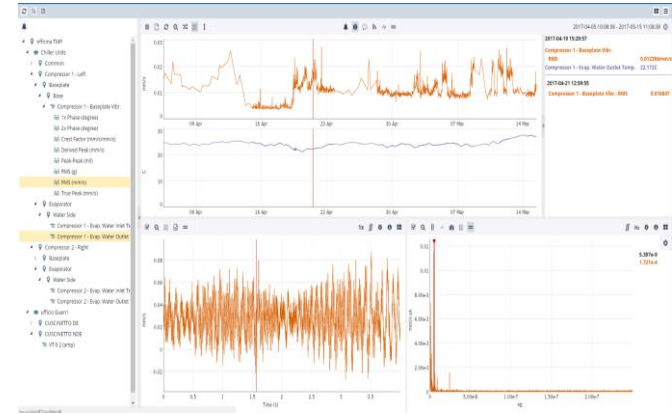
Trasmissione dati



TM.P. Cyclop Server



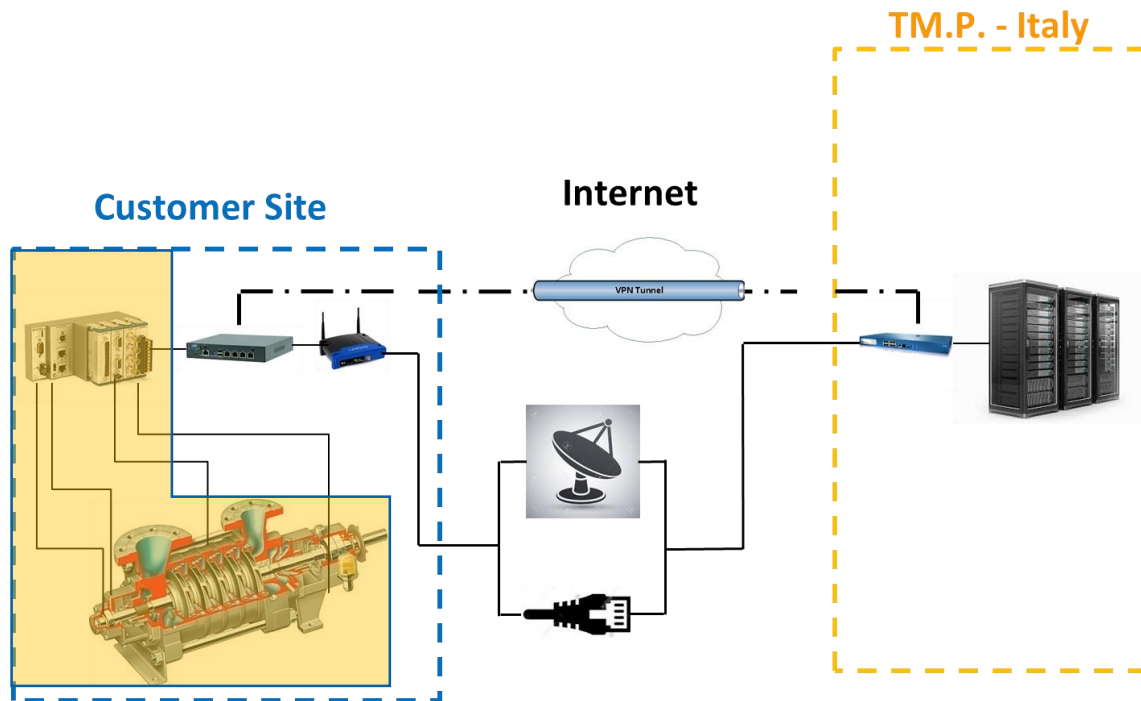
Raccolta e visualizzazione dati



Analisi e reporting

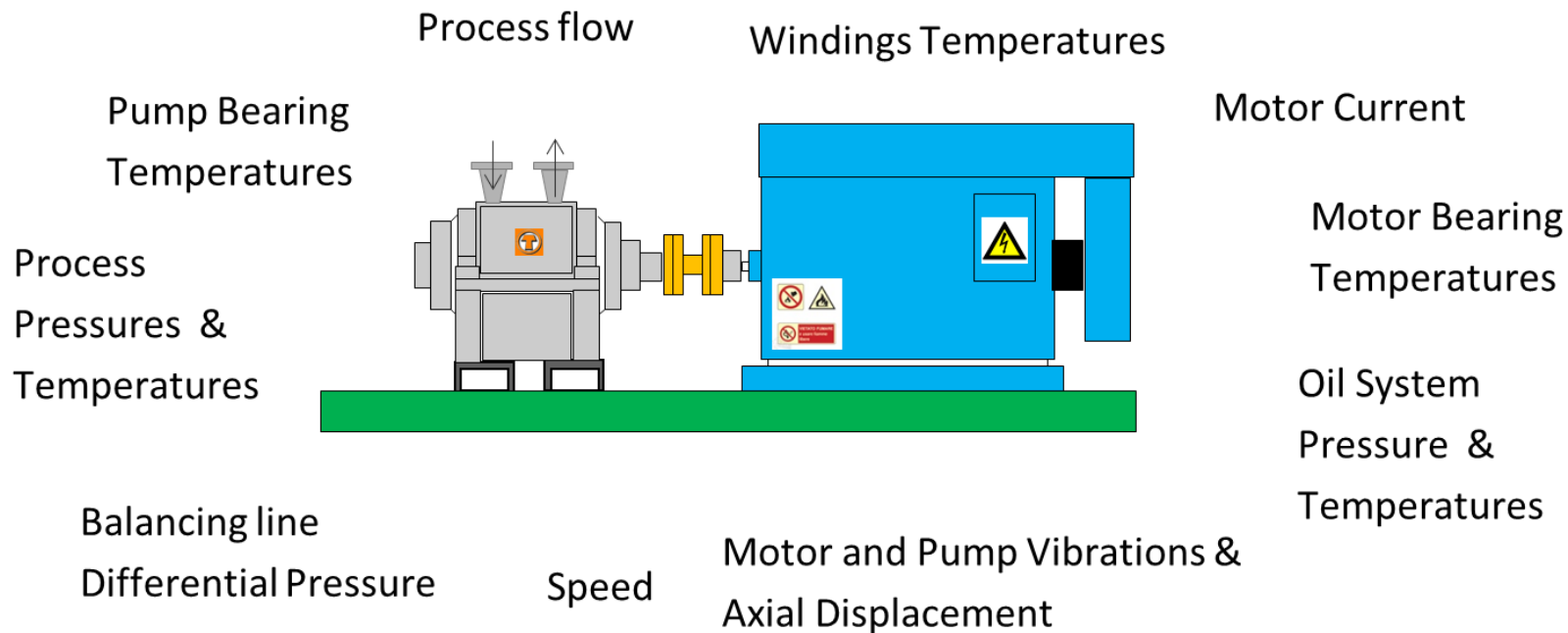
Cyclop 2.0

Architettura: visione d'insieme



Cyclop 2.0

Architettura: Segnali e strumenti 1/2



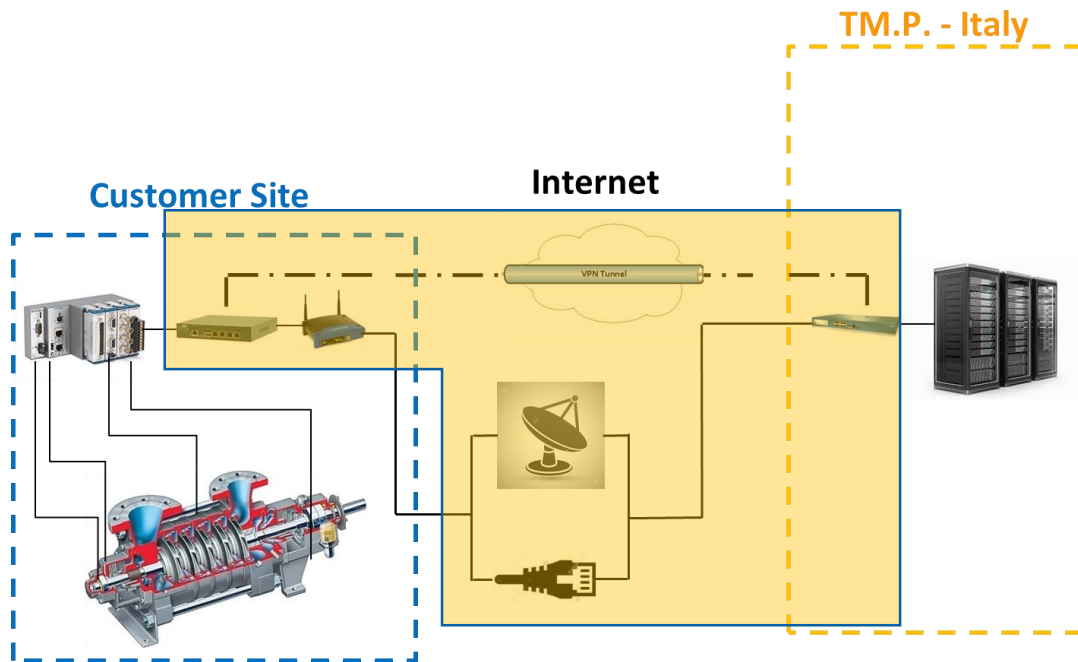
Cyclop 2.0

Architettura: Segnali e strumenti 2/2



Cyclop 2.0

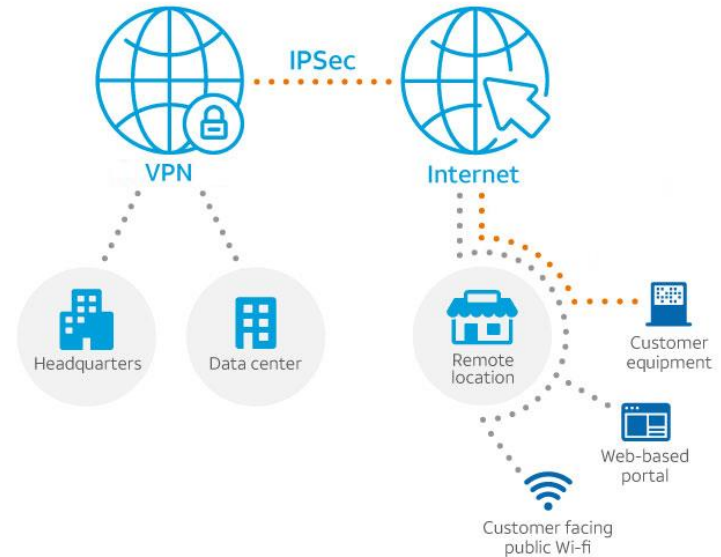
Architettura: visione d'insieme



Cyclop 2.0

Architettura: comunicazioni

- Sistema comunicazione indipendente
- Comunicazioni crittografate
- Standard IPsec
- Firewall perimetrale e remoto configurati TMP
- Server srv-Cyclop in TMP con Software NI

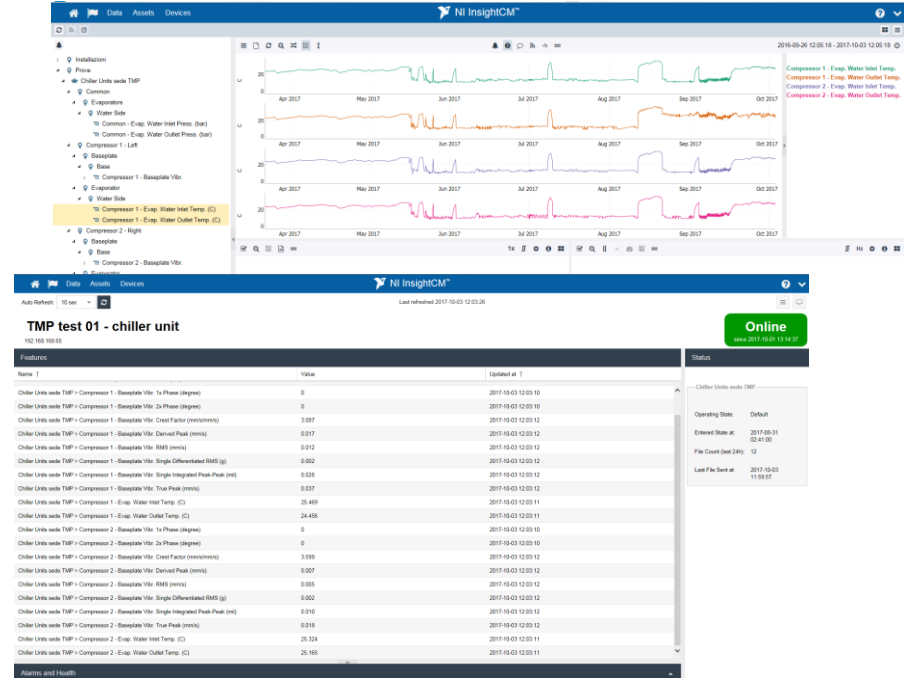
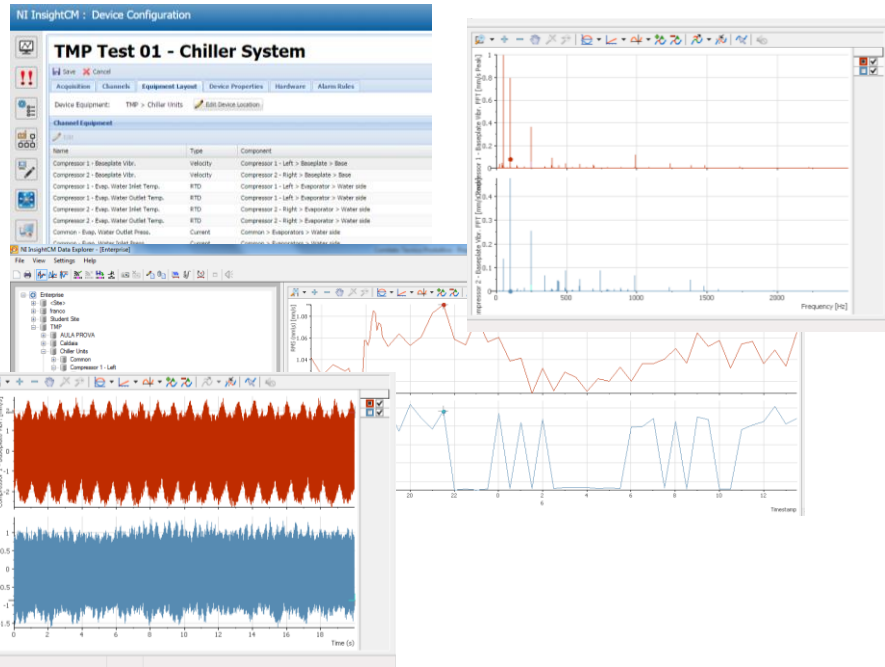


Cyclop 2.0

Software

NI InsightCM™ server 1.0

NI InsightCM™ server 3.0



Cyclop 2.0

Applicazioni TMP

CASO 1: Recorder Box

- Sistema registrazione dati
- Servizi di Garanzia
- Installazione per nuove macchine
- Linea guida tecnica

CASO 2: Remote monitoring

- Sistema integrato trasmissione
- Servizi di manutenzione e assistenza
- Installazione per macchine esistenti



Case Study

- Centrale Biomasse Nord Italia
 - Pompe TMP installate dal 2012
 - Servizio Alimento caldaia
 - Strumentazione base
 - Servizio continuo

Case Study

Pompa TMP installata

Elettropompa alimento Caldaia tipo:

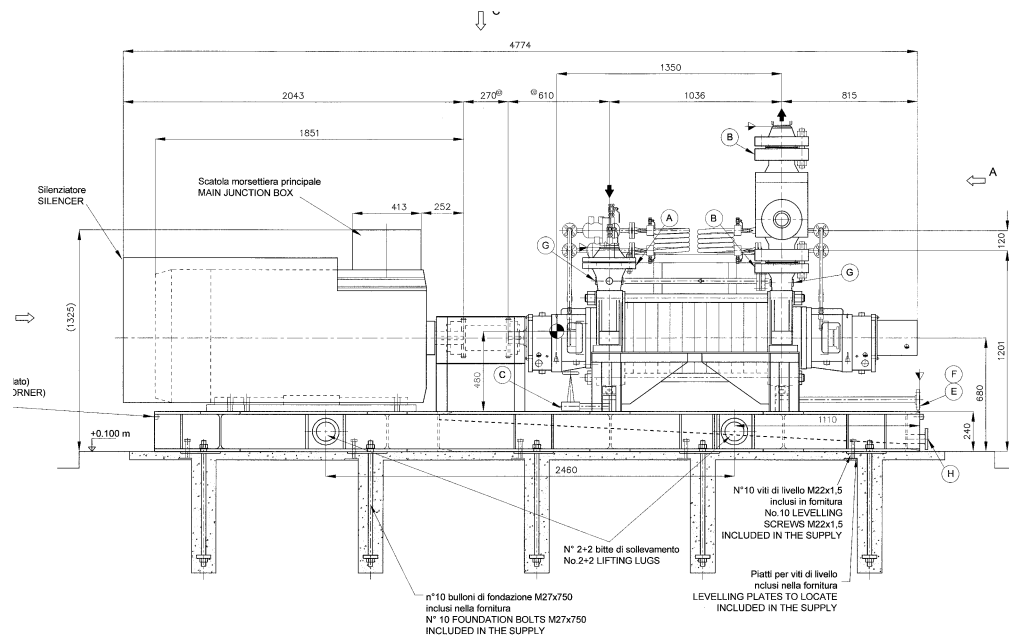
MES 80.13

Multistadio

Portata 86,1 m³/h

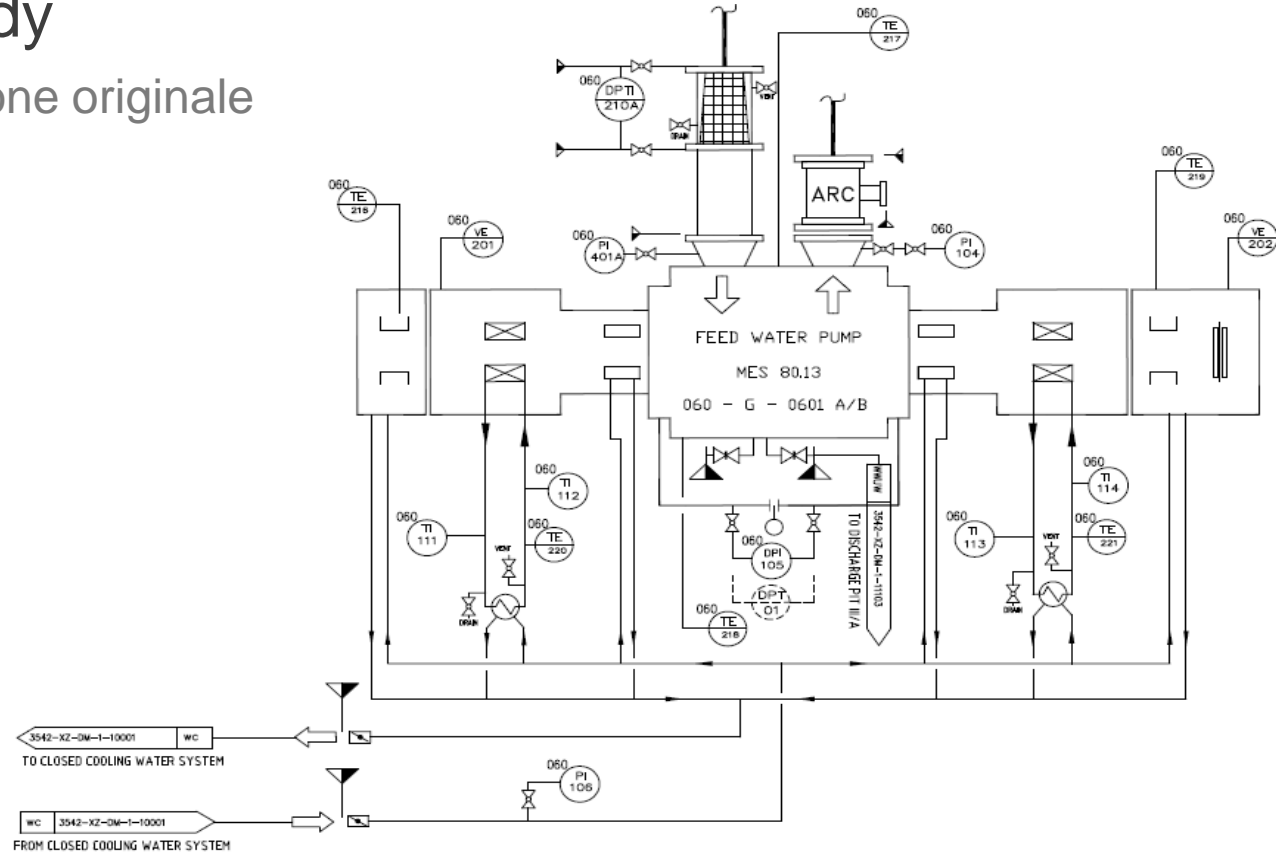
Prevalenza 1461 m

Motore elettrico 710 kW – 2980 RPM



Case Study

Strumentazione originale

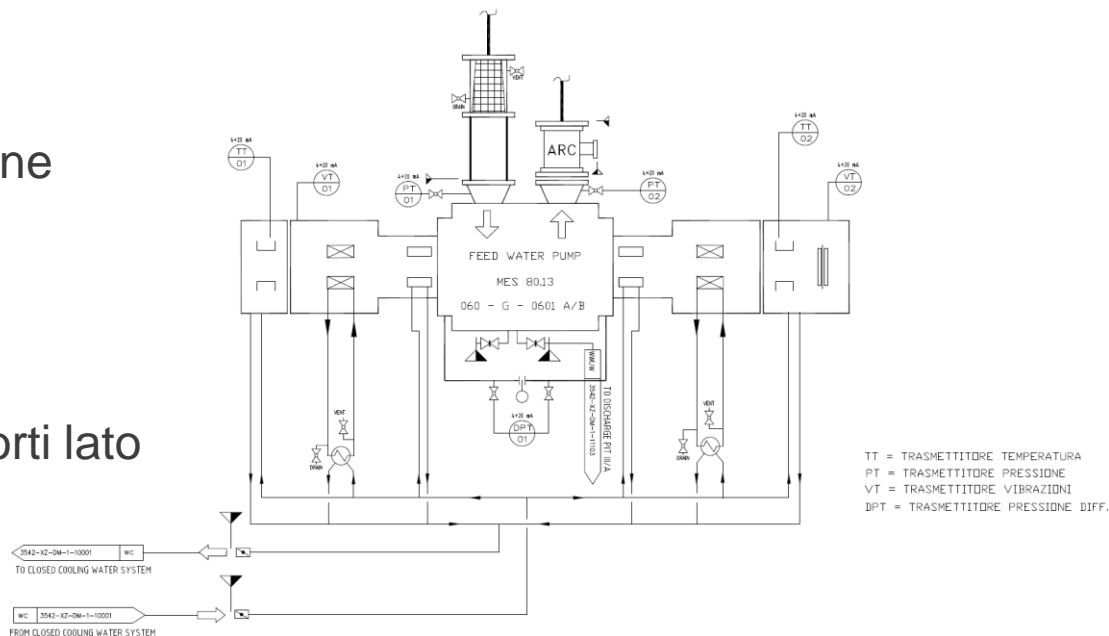


Case Study

Strumentazione modificata

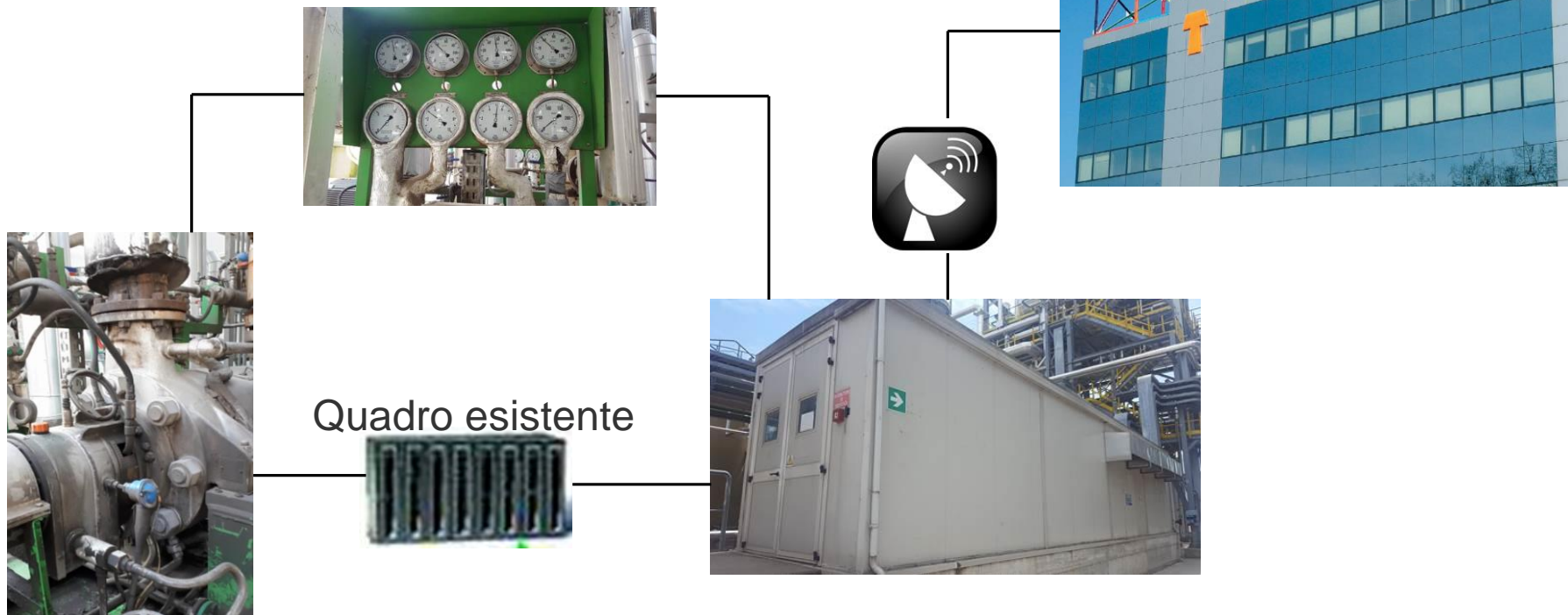
I dati monitorati:

- Pressioni mandata ed aspirazione
- Pressione differenziale linea di bilanciamento
- Vibrazione e temperatura supporti lato giunto e lato opposto giunto



Case Study

Schema nuovo sistema



Case Study

Schema nuovo sistema

In dettaglio:

- Installati tre trasmettitori di pressione in sostituzione dei manometri esistenti
- Per vibrazioni e temperature utilizzata la strumentazione esistente inserendo duplicatori di segnale
- Strumentazione collegata sistema di acquisizione dati- CRIO NI-9065 + Modulo NI 9208

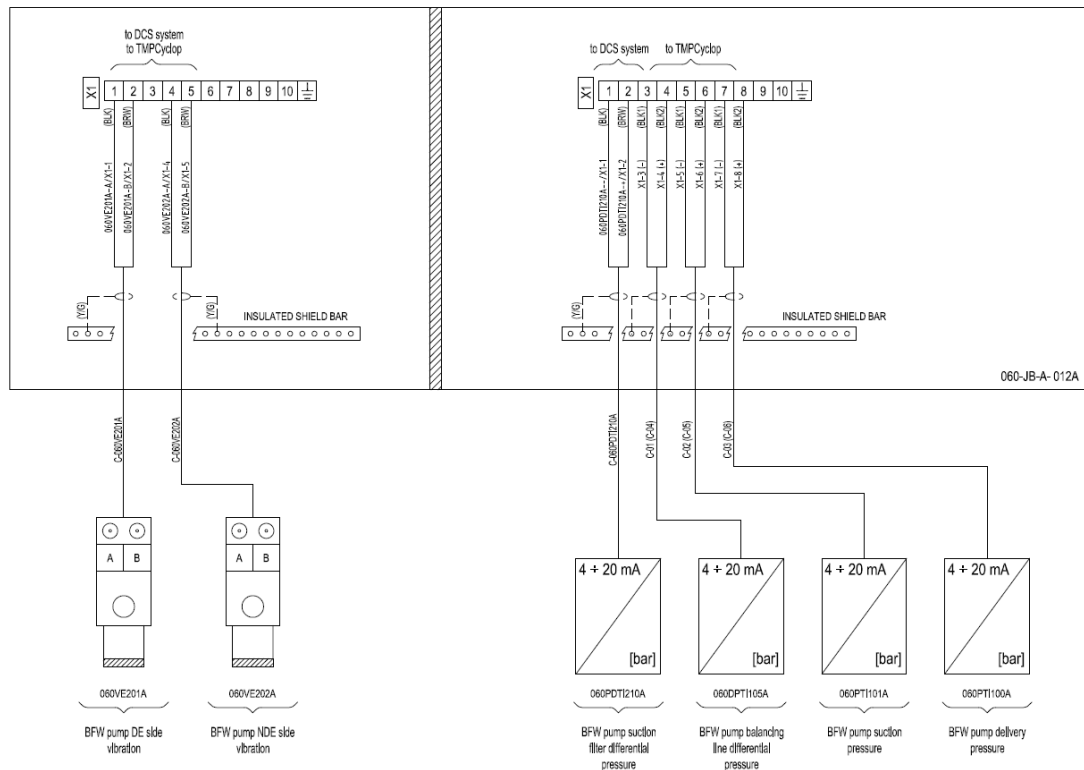


Case Study

Nuova architettura segnal

Nuovo schema cablaggio in JB

- Nuovi strumenti installati
- Altri segnali direttamente da PLC



Case Study

Nuova architettura segnali

Cablaggio in JB



Nuovi strumenti installati



CRio in quadro esistente



Router e Firewall



Parabola



Case Study

Set-up del sistema

NI InsightCM™

Cyclops-BiOlevano

Save Cancel

Equipment Mapping Channels Device Properties Hardware

Data Groups Manage Data Groups

Data Group	Asset
Pompe alimento caldaia	Italia > Nord > Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia

Channels Select Data Group

Channel	Data Group	Asset
DPT105A differenziale linea di bilanciamento (Mod1CH03)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
PT101A pressione aspirazione (Mod1CH01)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
PT100A pressione mandata (Mod1CH02)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
DPT105B differenziale linea di bilanciamento (Mod1CH03)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...
PT101B pressione aspirazione (Mod1CH04)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...
PT100B pressione mandata (Mod1CH05)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
TT216A temperatura supporto lato giunto (Mod1CH06)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
TT219A temperatura supporto lato giunto (Mod1CH07)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
VT201A vibrazione supporto lato giunto (Mod1CH10)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
VT202A vibrazione supporto lato opposto giunto (Mod1CH11)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 A > ...
TT216B temperatura supporto lato giunto (Mod1CH12)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...
TT219B temperatura supporto lato opposto giunto (Mod1CH13)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...
VT201B vibrazione supporto lato giunto (Mod1CH14)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...
VT202B vibrazione supporto lato opposto giunto (Mod1CH15)	Pompe alimento caldaia	Centrale BiOlevano a Castello D'Agogna PV > Pompe alimento caldaia > Pompa 060-G-0601 B > ...

Assets Show All

- Centrale BiOlevano a Castello D'Agogna PV
 - Pompe alimento caldaia
 - DPT105A differenziale linea di bilanciamento
 - PT100A pressione mandata
 - PT101A pressione aspirazione
 - TT216A temperatura supporto lato giunto
 - TT219A temperatura supporto lato opposto giunto
 - VT201A vibrazione supporto lato giunto
 - VT202A vibrazione supporto lato opposto giunto
 - Pompa 060-G-0601 B
 - DPT105B differenziale linea di bilanciamento
 - PT100B pressione mandata
 - PT101B pressione aspirazione
 - TT216B temperatura supporto lato giunto
 - TT219B temperatura supporto lato opposto giunto
 - VT201B vibrazione supporto lato giunto
 - VT202B vibrazione supporto lato opposto giunto

NI InsightCM™

Add Remove Validate Clear Selections

Invalid



Installazioni

- Italia
 - Nord
 - Centrale BiOlevano a Castello D'Agogna PV
 - Pompe alimento caldaia
 - Pompa 060-G-0601 A
 - DPT105A differenziale linea di bilanciamento
 - PT100A pressione mandata
 - PT101A pressione aspirazione
 - TT216A temperatura supporto lato giunto
 - TT219A temperatura supporto lato opposto giunto
 - VT201A vibrazione supporto lato giunto
 - VT202A vibrazione supporto lato opposto giunto
 - Pompa 060-G-0601 B
 - DPT105B differenziale linea di bilanciamento
 - PT100B pressione mandata
 - PT101B pressione aspirazione
 - TT216B temperatura supporto lato giunto
 - TT219B temperatura supporto lato opposto giunto
 - VT201B vibrazione supporto lato giunto
 - VT202B vibrazione supporto lato opposto giunto



- Prove
 - Chiller Units sede TMP
 - ufficio Guerri


Case Study

Set-up del sistema



 Data Assets Devices

NI InsightCM™



Auto Refresh: 10 sec 

Last refreshed 2017-08-31 11:39:20



Cyclops-BiOlevano

192.168.100.21

Online

since 2017-08-30 17:04:39

Features

Name ↑	Value	Updated at ↑
Pompe alimento caldaia > DPT105A differenziale linea di bilanciamento (bar g)	3.582	2017-08-31 11:39:19
Pompe alimento caldaia > DPT105B differenziale linea di bilanciamento (bar g)	0.003	2017-08-31 11:39:19
Pompe alimento caldaia > PT100A pressione mandata (bar g)	116.903	2017-08-31 11:39:19
Pompe alimento caldaia > PT100B pressione mandata (bar g)	2.596	2017-08-31 11:39:19
Pompe alimento caldaia > PT101A pressione aspirazione (bar g)	2.459	2017-08-31 11:39:19
Pompe alimento caldaia > PT101B pressione aspirazione (bar g)	2.668	2017-08-31 11:39:19
Pompe alimento caldaia > TT216A temperatura supporto lato giunto (C)	51.959	2017-08-31 11:39:19
Pompe alimento caldaia > TT216B temperatura supporto lato giunto (C)	26.759	2017-08-31 11:39:19
Pompe alimento caldaia > TT219A temperatura supporto lato opposto giunto (C)	72.635	2017-08-31 11:39:19
Pompe alimento caldaia > TT219B temperatura supporto lato opposto giunto (C)	24.813	2017-08-31 11:39:19
Pompe alimento caldaia > VT201A vibrazione supporto lato giunto (mm/s)	0.543	2017-08-31 11:39:19
Pompe alimento caldaia > VT201B vibrazione supporto lato giunto (mm/s)	0.000	2017-08-31 11:39:19
Pompe alimento caldaia > VT202A vibrazione supporto lato opposto giunto (mm/s)	0.448	2017-08-31 11:39:19

Status

Pompe alimento caldaia



Operating State: Default

File Count (last 24h): 0



Last File Sent at:


Case Study

Set-up del sistema



 Data Assets Devices

NI InsightCM™



Auto Refresh: 10 sec 

Last refreshed 2017-08-31 11:39:20



Cyclops-BiOlevano

192.168.100.21

Online

since 2017-08-30 17:04:39

Features

Name ↑	Value	Updated at ↑
Pompe alimento caldaia > DPT105A differenziale linea di bilanciamento (bar g)	3.582	2017-08-31 11:39:19
Pompe alimento caldaia > DPT105B differenziale linea di bilanciamento (bar g)	0.003	2017-08-31 11:39:19
Pompe alimento caldaia > PT100A pressione mandata (bar g)	116.903	2017-08-31 11:39:19
Pompe alimento caldaia > PT100B pressione mandata (bar g)	2.596	2017-08-31 11:39:19
Pompe alimento caldaia > PT101A pressione aspirazione (bar g)	2.459	2017-08-31 11:39:19
Pompe alimento caldaia > PT101B pressione aspirazione (bar g)	2.668	2017-08-31 11:39:19
Pompe alimento caldaia > TT216A temperatura supporto lato giunto (C)	51.959	2017-08-31 11:39:19
Pompe alimento caldaia > TT216B temperatura supporto lato giunto (C)	26.759	2017-08-31 11:39:19
Pompe alimento caldaia > TT219A temperatura supporto lato opposto giunto (C)	72.635	2017-08-31 11:39:19
Pompe alimento caldaia > TT219B temperatura supporto lato opposto giunto (C)	24.813	2017-08-31 11:39:19
Pompe alimento caldaia > VT201A vibrazione supporto lato giunto (mm/s)	0.543	2017-08-31 11:39:19
Pompe alimento caldaia > VT201B vibrazione supporto lato giunto (mm/s)	0.000	2017-08-31 11:39:19
Pompe alimento caldaia > VT202A vibrazione supporto lato opposto giunto (mm/s)	0.448	2017-08-31 11:39:19

Status

Pompe alimento caldaia

Operating State: Default

File Count (last 24h): 0

Last File Sent at:

Case Study

Trend registrati: Pompa A – Pressioni



- Linea bilanciamento

- Pressione di Mandata

Case Study

Trend registrati: Pompa A – Vibrazioni e Temperature



- Temperature cassa cuscinetto

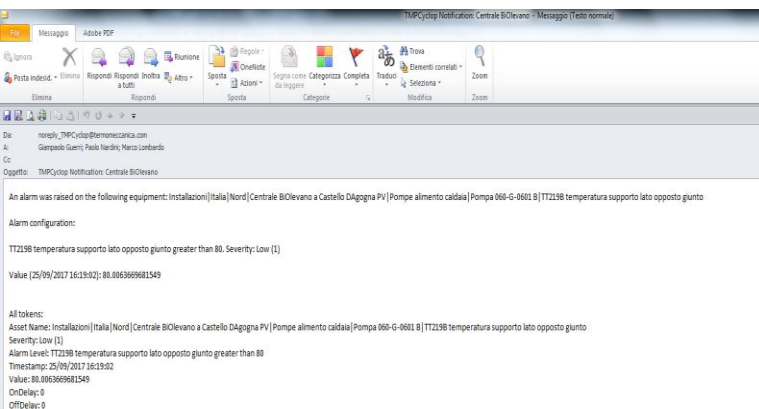


- Vibrazioni

Case Study

Dettaglio intervento: 26 settembre 2017

- Per normale rotazione pompa B messa in marcia e pompa A spenta
- Alti valori di temperatura registrati – Invio allarmi in TMP
- Contattato impianto: regolazione ausiliari per risoluzione problema



TMP Cyclop: Nuovi orizzonti

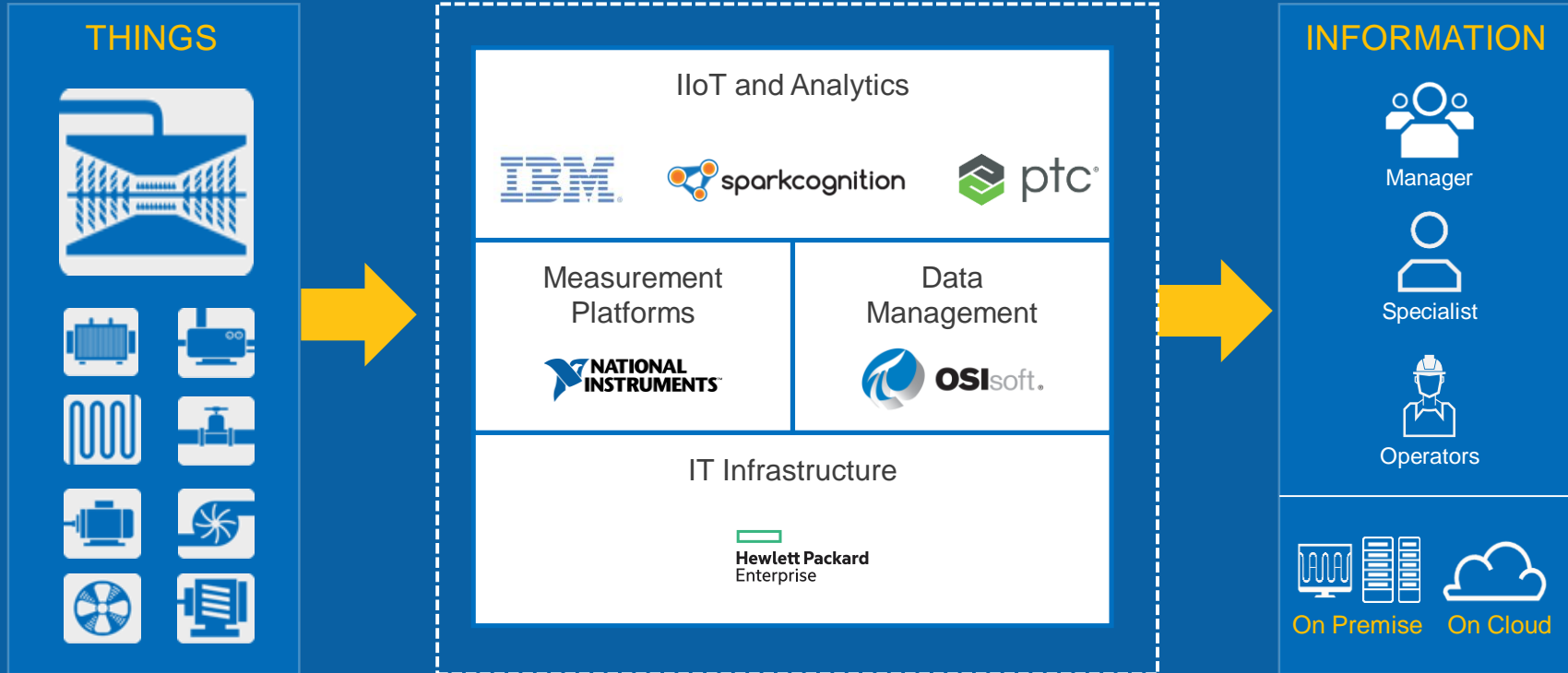
Cosa chiede il mercato

- Sistema accessibile
- Portabilità
- Soluzioni real time

Come implementarlo

- Portale personalizzato
- Soluzioni mobili (smartphone)
- Sistema esperto

The IoT Ecosystem



OSIsoft @NIDays

Luca Branca, Account Executive

Daniele Farris, Systems Engineer

Alberto Pinzello, Account Executive

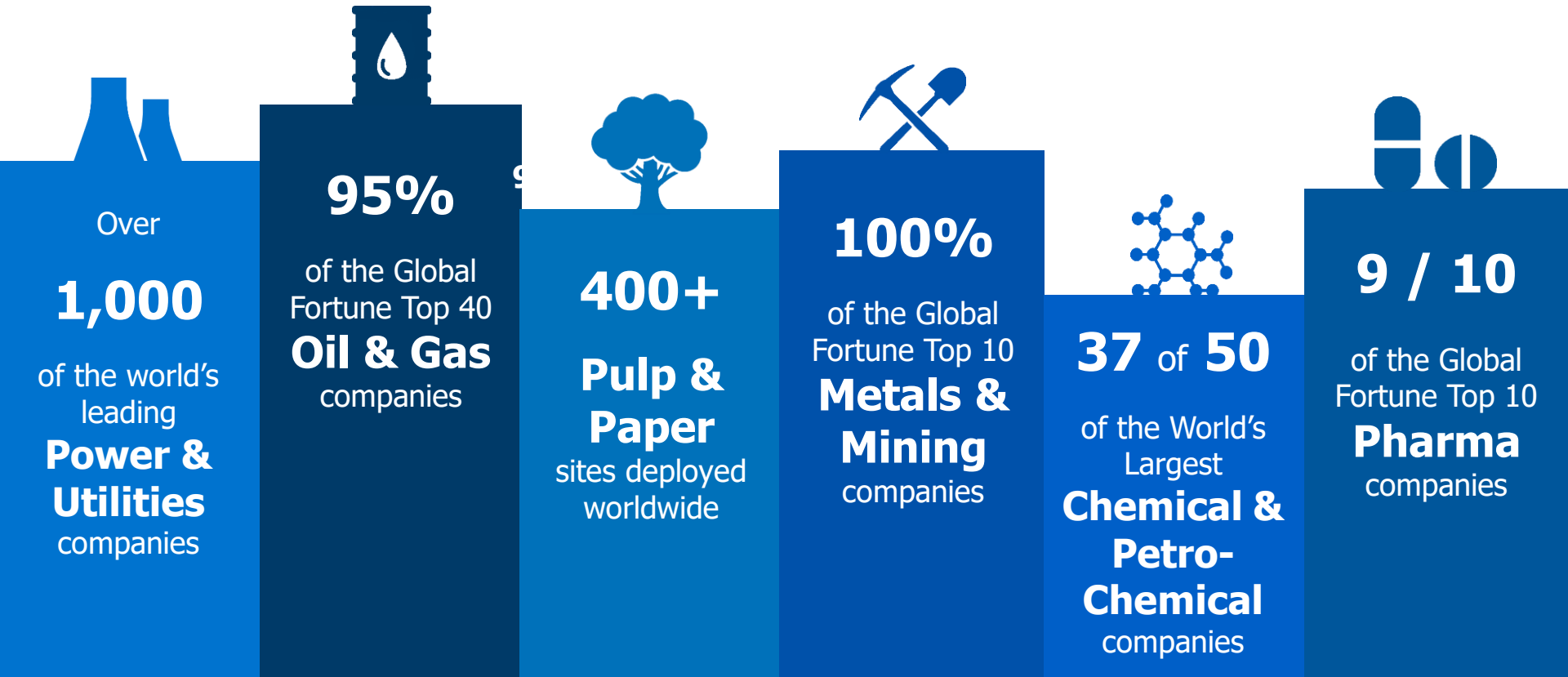
Nov, 14th 2017



Process data vs. Condition Monitoring (CM) data

- Process data - continuous online measurements
 - Data source - Control, Safety, Environmental, Process monitoring, Trips/Interlocks
 - SCADA, PLCs, other instrumentation, IIoT ...
 - Process measurements - Pressure, temperature, flowrate, level, amperage, voltage
 - Equipment states - Open/Close, Running/Stopped,...
- CM data (may not be on-line and may not be continuous) (follows IoT data-flow pattern)
 - Vibration
 - Infrared (Thermography)
 - Acoustic (Ultrasound)
 - Motor current analysis
 - Oil sampling - motor oil, transformer oil...
 - Strain-gauge (coke drums in a refinery)
 - ...

OSIsoft is Global Leader Enabling Operational Intelligence



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Empowering Business in **Real-Time.**

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PI System Infrastructure

Equipment / Asset



Real-time Reports



Real-time Monitoring



Advanced Analytics

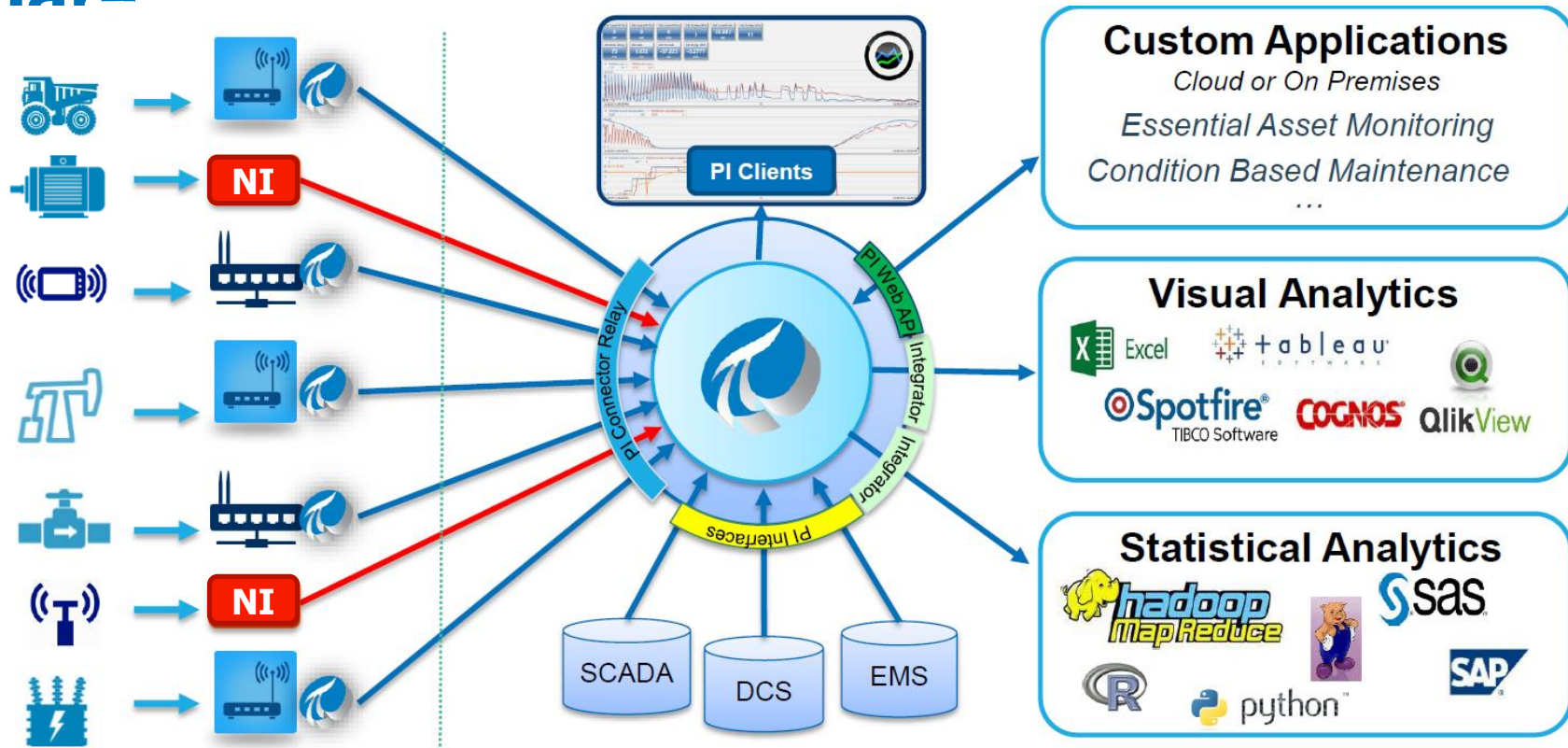


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Process data *AND* Condition Monitoring (CM) data

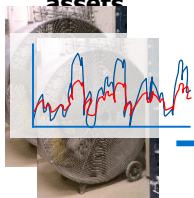


OSIsoft.

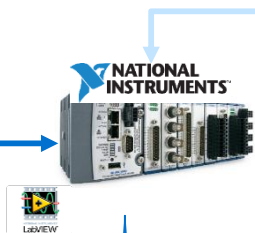
Empowering Business in **Real-Time.**

IIoT Converged Architecture: National Instruments + OSIssoft

Traditional industrial and ruggedized sensors for monitoring critical assets



National Instruments CompactRIO



OSIssoft Connector PC



OSIssoft PI Data Archive



OSIssoft PI Asset Framework



OSIssoft PI Web API and PI Coresight Server



User phones, tablets, laptops, and desktops



Sensors are directly connected to the CompactRIO so that raw analog or digital sensor readings can be received

LabVIEW toolkit sends live data events as HTTP messages, using the OSIssoft Message Format (OMF) protocol

Sensor configuration is done **once** on the CompactRIO; that configuration is sent via OMF to build PI Points and PI AF Elements

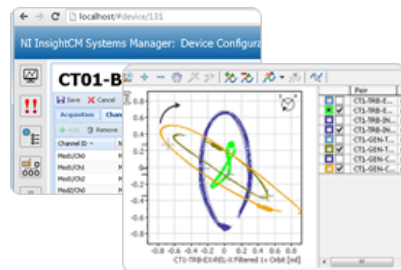
PI Connector Relay receives OMF messages and automatically both creates *and* updates PI AF Elements and PI Points with new data values and metadata

IoT data *and* data from other sources is compressed and archived in real-time

PI AF organizes and templatises data and applies event framing, analytics, and notifications

PI Coresight allows cross-browser, cross-platform access to all current and historical data, metadata, and calculations

National Instruments InsightCM



InsightCM provides industry-leading full-fledged condition-monitoring capabilities

* Raw data, calculations, metadata, and event frames are read back into the CompactRIO, via the PI Web API, for edge computing and analysis



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Project Duke Energy Smart Generation



Customer Profile

- Largest power generation in US
- 38 GW Fossil Generation Capacity

60+
Sites

10,000
Assets to Monitor

30,000
Sensors

60,000
Manual Rounds/Month
for Data Collection

Business Need

- **Increase Revenue:** Increase uptime and service offerings, and optimize asset maintenance activity.
- **Reduce Costs:** Reduce warranty repair costs, frequency of unscheduled downtime, and optimize the workforce.
- **Increase Safety:** Reduce worker exposure to dangerous machines/environments.
- **Reduce Risk:** Prevent catastrophic failure and unscheduled outages.



Challenge: Better leverage new technologies to address increasing reliability demands and workforce optimization.

1. Aging plants with critical equipment at end-of-life



in **Real-Time.**

2. Scarcity of specialists



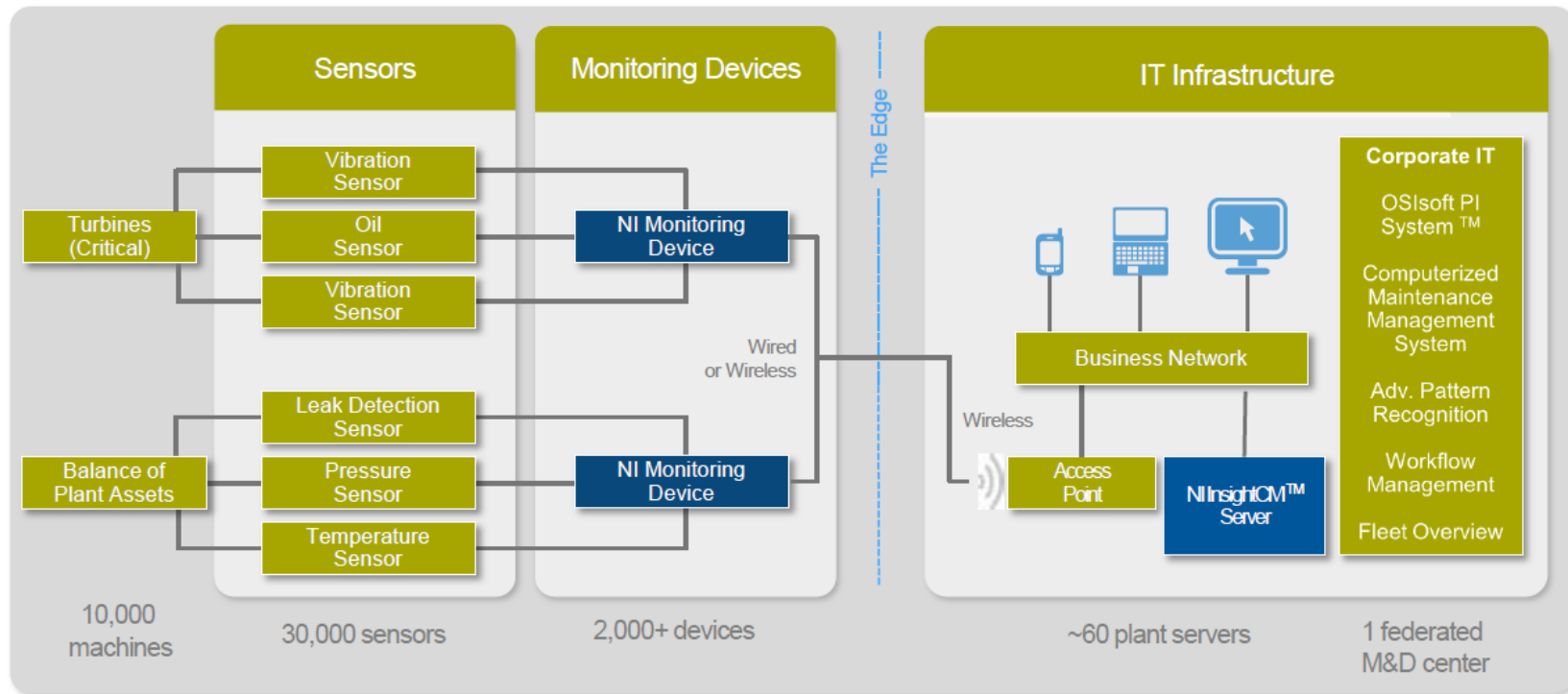
3. Inefficient workforce utilization, 80% Data Collection, 20% Analysis



Duke Energy - Transforming Plant Monitoring



- Largest Power Generation Holding Company in USA
- 38GW Fossil Generation Capacity



Impact on Business Metrics



Implementation of solution



Equipment Assessment

Survey and classify 60+ Sites, and 10,000 assets for critical, important or run-to-failure strategies



Infrastructure Installation

Investment in technology and integration services for sensors, data acquisition nodes, cables and networking installation.



Workforce Training

Extensive training program customized to each worker role

Driving key metrics in productivity



Enhanced Safety

Replaces manual data collection in hazardous areas/conditions



Optimized Maintenance

5X reduction in manual rounds, better worker utilization with remote diagnostics and analysis



Improved Cost Avoidance

Automated early detection of equipment issues can avoid catastrophic failures



Increased Output and Savings

Additional revenue annually by effectively identifying performance issues saving fuel and improving downtime

“Without additional resources or new equipment condition monitoring technologies, the risk of equipment failures will likely increase.” – Bernie Cook, former Duke Energy Director



Conclusions: Benefits of NI and OSIssoft Technologies

- **Cost effective** alternative that can enable companies to outfit large scale fleet for fuller visibility
- **Customize, scale and future proof** your solution to meet current and evolving business needs
- Gain access to the **raw data** and easily **integrate with existing enterprise infrastructure**
- **Multiple measurements in a flexible platform**, combine vibration, electrical, process measurements in the same software
- **Open Solution** allows support for 3rd party hardware, custom analytics and **full access to data** to connect with 3rd party IIOT and Analytics packages



Thank you

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The logo for NIDays Engineer Next is centered on a blue background with diagonal stripes. It features the text "NIDays" in white inside a white rectangular box, followed by "ENGINEER" in white capital letters, and "NEXT" in large white capital letters. A yellow graphic element, resembling a stylized 'N' or a folded ribbon, is positioned between "ENGINEER" and "NEXT".

NIDays ENGINEER
NEXT