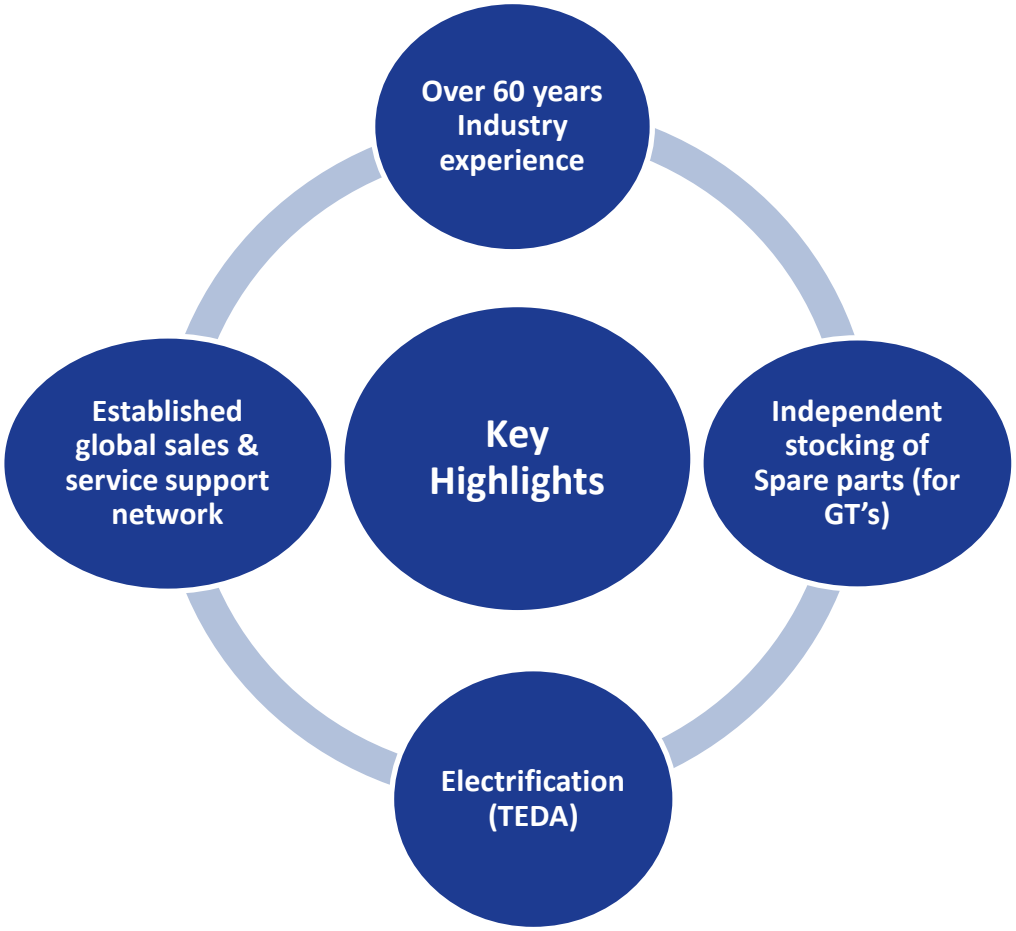
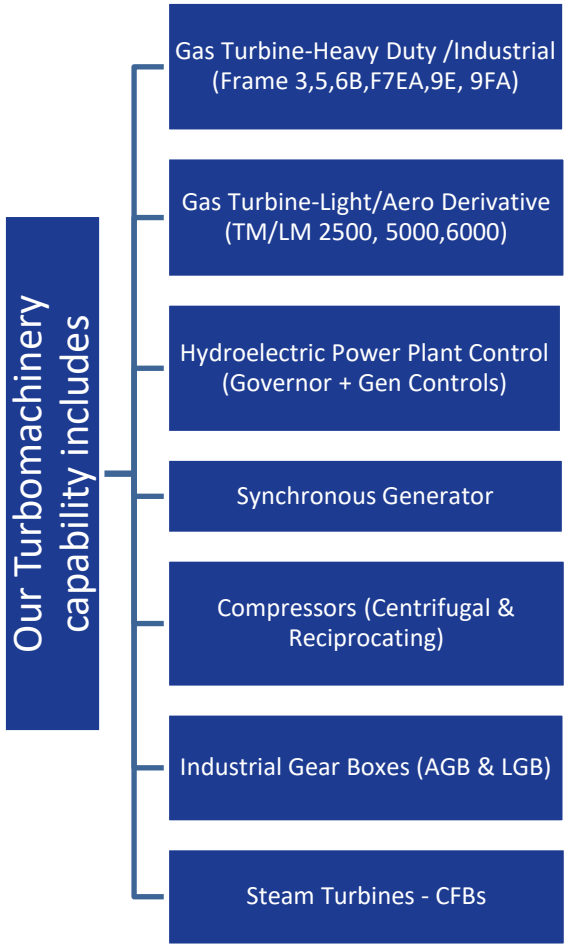
TCS CORPORATE PRESENTATION

Harnessing the **Industrial Digital Transformation**

TCS INTRODUCTION - GROUP OVERVIEW

Established in 2009, TCS began its journey as a Leading Engineering Solutions provider. TCS provides customized solutions on a turnkey basis, from engineering concept to installation, commissioning, startup, training, digitalization, remote monitoring and support.





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TCS INTRODUCTION - GROUP OVERVIEW

OUR VISION

To be a leading engineering solution provider and help our clients by providing cost-effective solutions & services.

OUR MISSION

To provide the highest quality engineering solutions & services with the right skillset to cater for our customers' needs. We're committed to providing our customers with cost-effective solutions & services to solving their plants and equipment's toughest
challenges.

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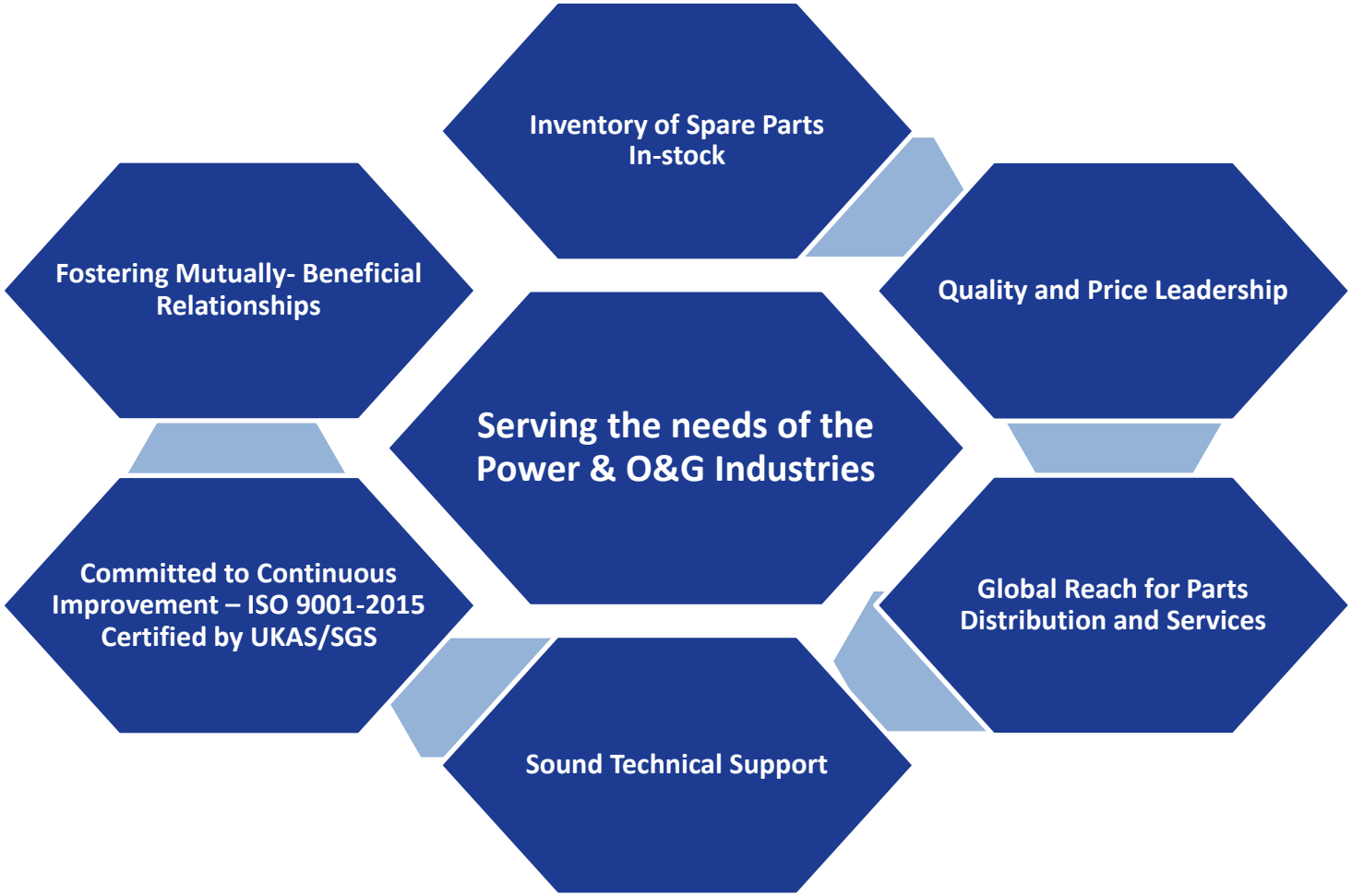
WHY CHOOSE US?



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GLOBAL PRESENCE

Headquarters

Warehouse/Repair shop

Branch Office/ Intl. Representation

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PARTNERS

TCS partners with some renowned brands for sourcing and packaging. It includes Hardware and Software both.

Rockwell Automation	GE Digital	Aveva	GE	ABB	Woodward
Hardware •Controllogix5000 •Compactlogix •Micrologix **Software** •RSLogix5000 •Studio5000	**Software** •APM •Predictive Analytics •iFix-Cimplicity •Historian	**Software** •APM •Predictive Maintenance •Wonderware HMI/SCADA •Wonderware Historian •Monitor & Control	**Hardware** •RX3i •RX7i •MK VI/Vie **Software** •Cimplicity •iFlix •ST Toolbox	**Hardware** •Unitrol 1010 – 1020 •Unitrol 6000 •REG Protection Relay **Software** •CMT1000 •PCM600	**Hardware** •Micronet TMR Plus •505E •5009 •Vertex-XT **Software** •GAP •APManager

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OUR SERVICES & SOLUTIONS

ENGINEERED SOLUTIONS

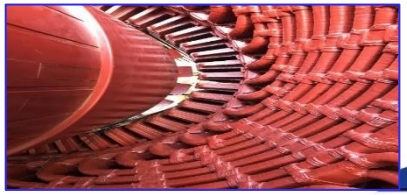
1. Retrofit & Upgrade Solutions
2. Performance Improvement
3. Monitoring & Diagnostics
4. Electrification (TEDA®)
5. Flare gas to power

INDUSTRIAL DIGITALIZATION

1. Predictive Analysis (Maintenance)
2. Asset Performance Management
3. Digitalization Readiness
4. MOR (Mobile Operator Rounds)
5. HMI-SCADA-HISTORIAN

SERVICES

1. Planned & Unplanned Maintenance
2. Synchronous Generator
3. Plant Reliability Compass
4. Valves repair & Overhauling
5. Training
6. Spare Parts



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ENGINEERED SOLUTIONS

1- RETROFITS & UPGRADE SOLUTIONS

2- PERFORMANCE IMPROVEMENT

3- MONITORING & DIAGNOSTICS

4- ELECTRIFICATION (TEDA®)

5- FLARE GAS TO POWER

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1- RETROFITS & UPGRADE SOLUTIONS

Key Features

- Built on the most advanced programmable controller platforms available today.
- Our Control System is designed using the latest technology in distributed control philosophy.
- With our hardware independent approach, spare parts can be obtained from various channels, i.e. OEM, System Integrators, Third party distributor.
- Installed on GE Frames 5, 6, 7, LM2500, RR RB211, Solar Mars 90, Westinghouse, and many others.

We have experience on

Gas Turbines	Steam Turbines	Hydro Turbines	Generators	Gas Compressors	Gensets	Centrifugal Pump Control
- GE Heavy Duty and Aeroderivative - P&W - RR - SOLAR Turbines	- GE - Toshiba - Hitachi - Mitsubishi - Ebara - Dresser Rand	- Francis -Kaplan - Bulb - Pelton	- Brush - ABB - Siemens - Andritz - Ellin	- Nuovo Pignone - Dresser Rand - Ebara - MAN - Atlas Copco	- Diesel Engine - Gas Engine - Dual fuel Engine	

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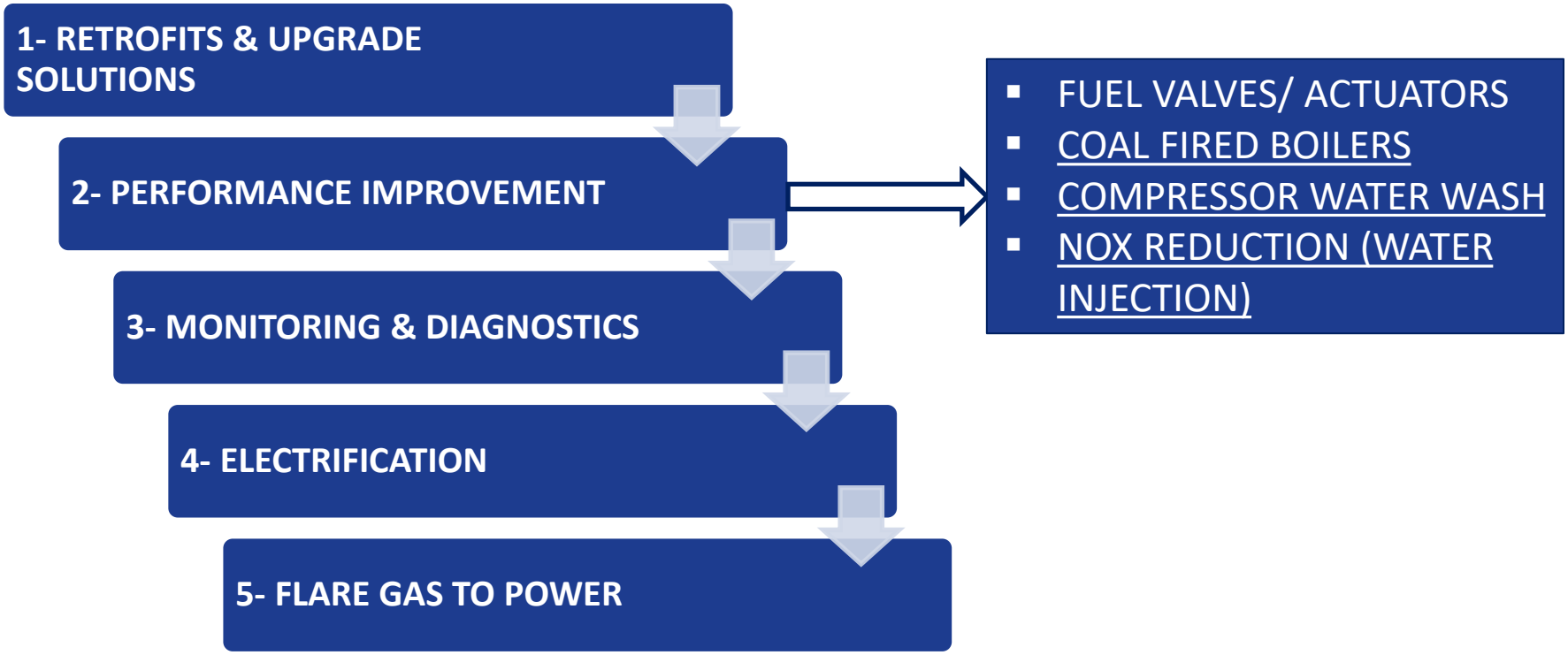
ENGINEERED SOLUTIONS



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2- PERFORMANCE IMPROVEMENT

1- FUEL VALVES / ACTUATORS

TYPE OF VALVES

- Gas turbine fuel valve
- Steam turbine control valve
- Turbine trip valve
- Compressor IGV’s

OUR SERVICES INCLUDE

- Design selection
- System Integration
- Installation & commissioning
- After Sales Support

BENEFITS

- Improved unit availability and reliability will increase substantially (Less trips).
- Life cycle cost of the electric valve is much lower than the current old, potentially obsolete hydraulic valve assembly.
- Reduced maintenance and lower spare parts costs




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3- MONITORING & DIAGNOSTICS

1- COMBUSTION DYNAMIC MONITORING

TCS' CDMS is an in-house developed system for measuring dynamic pressure pulsations in gas turbine. Hardware configuration and setup are simple, and the software is user-friendly and provides data in formats that DLN tuners and operators need to optimize DLN operation quickly. This system can is available in portable and permanently installed systems.

Advantages

- Continuous dynamic monitoring.
- High Temperature Sensor for accurate amplitude resolution.
- User-specified alarm capability to alert operators to potentially harmful dynamic amplitude levels
- Data import/export options to merge and correlate dynamics with turbine operating parameters and emissions data
- Built-in historical logging and trending.
- Can be configured for remote monitoring and tuning applications.

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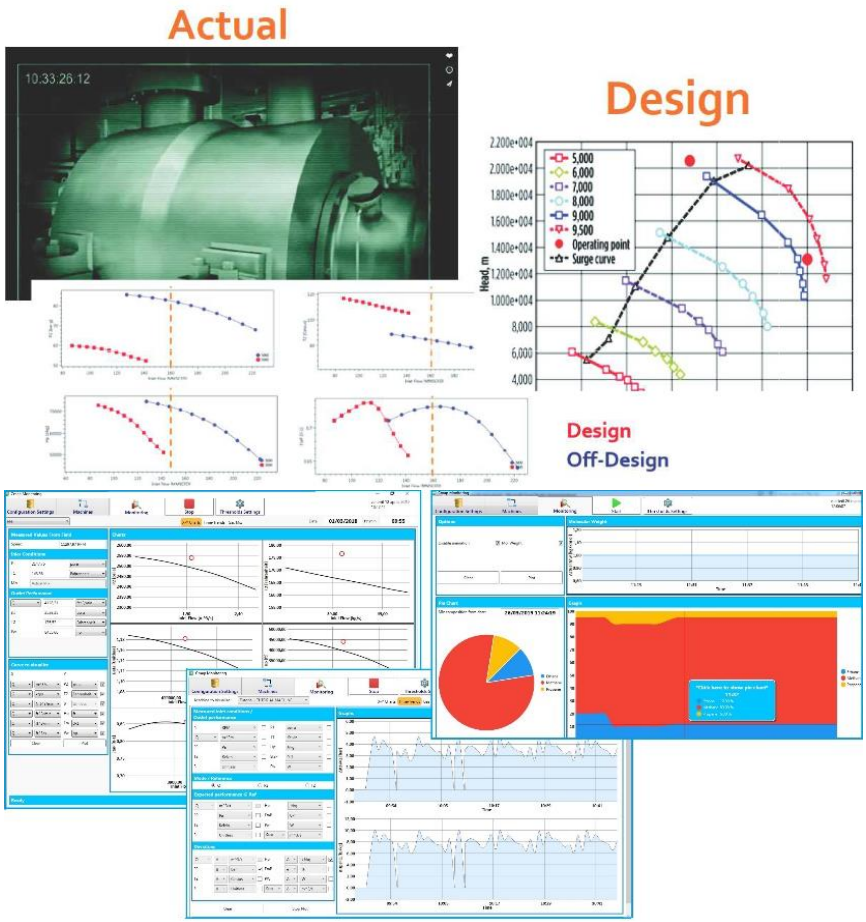
3- MONITORING & DIAGNOSTICS

2- COMPRESSOR PERFORMANCE EVALUATION:

The CCPES provides continuous monitoring and evaluation of Centrifugal Compressor Performance in real time.

Key Features

- Performance Evaluation is based on the comparison between the actual performance and the design or expected performance in an optimal health condition.
- Quantitative performance evaluation approach allows the implementation of predictive maintenance strategies for early of anomalies.
- The software stores the reference or design performance in a computer memory.
- This reference or design data is used as an input to create the machine model for accurate prediction of the performance.
- It will continuous compare actual performance obtained from site measurements of operative parameters to the expected performance
- The calculation method is ASME PTC10 Compliant.



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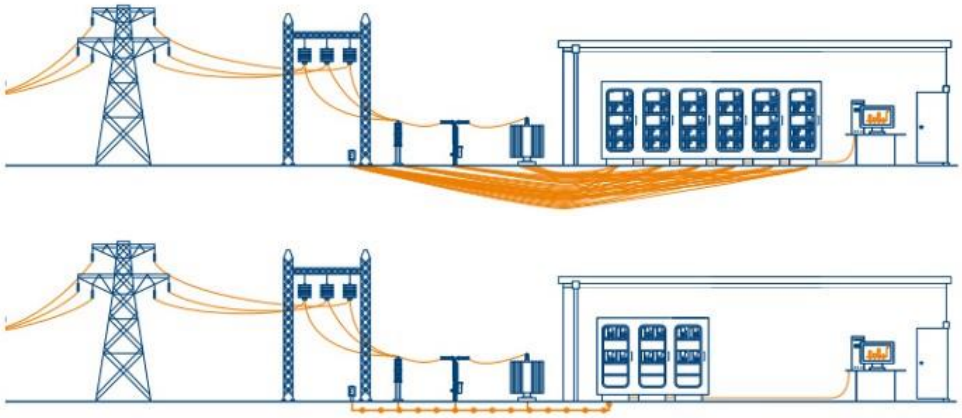
4- ELECTRIFICATION

1- DIGITAL SUBSTATION

Why Digital Substation?

1. Footprint reduction/ Copper reduction
- Reduced substation footprint by ~60% (Interoperability–Reduces copper cabling)
- Ease of configuration
- Maximum reliability and availability
- Real-time performance
- Smart Grid communications capabilities
- Reduces total cost of ownership

2. Safety
- Primary equipment: Oil-free instrument transformers
- Secondary equipment: Removal of CT secondary circuit, removal of need to change ratio taps



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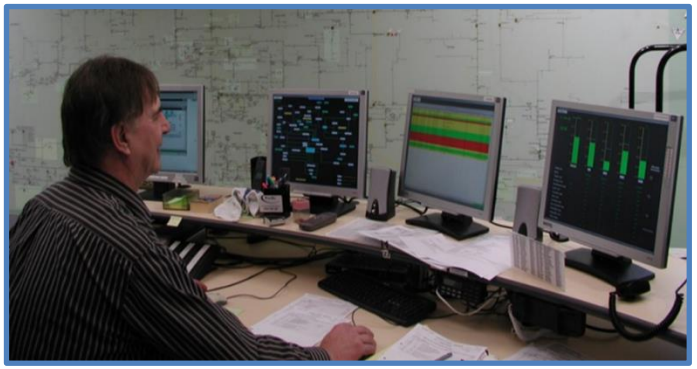
2- ELECTRIC UTILITIES SCADA

Key Features

- Secure operator supervisory control
- Real-time data communication & dynamic data display
- Scalable for thousands of connected I/O devices
- Alarm, event, off-normal, sequence of events
- Equipment control tag, information tag, and manual overwrite
- High availability architecture
- Historical data storage, trending and reporting
- Mobile / Web-enabled operations

Benefits

- Safe and secure operations
- Easy to learn & easy to use
- Enhanced operator decision making
- Increased productivity & accountability
- Low cost of ownership, proven & reliable
- Industry standards compliant
- Flexible and highly configurable



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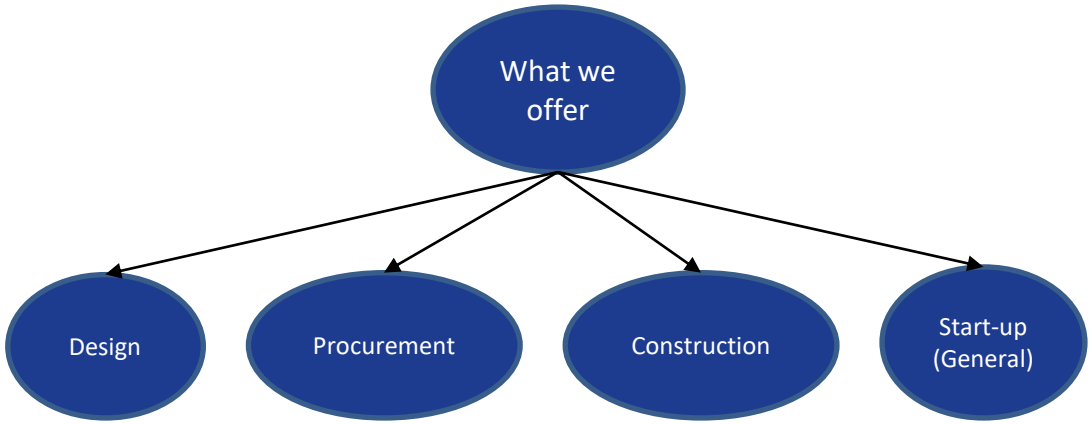
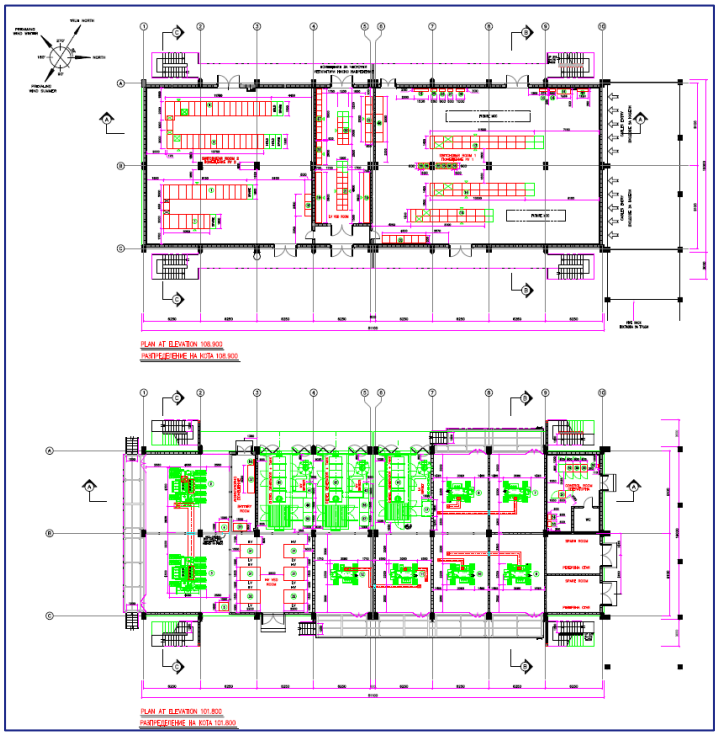
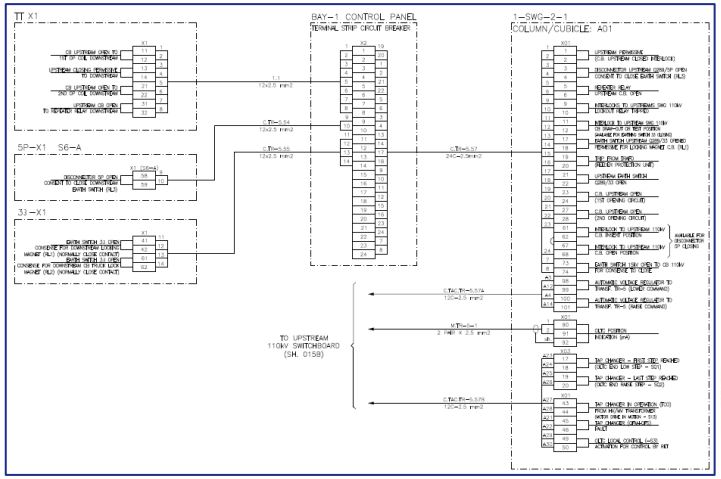
4- ELECTRIFICATION

3- ELECTRICAL SERVICES





- Design as per IEC, NEC/NFPA, GOST international codes. Inclusion of local codes and standards where required.
- Electrical substations and E-house
- New systems/plants, retrofit, upgrades
- *Sub-systems*:
  - HV and MV switchgears (air and gas insulated)
  - LV switchgears
  - SCADA and PMS
  - Electrical Generation and Motors
  - UPS and batteries
  - Transformers
  - VFDs, soft-starters and power electronics
  - Ex equipment selection
  - Electrical Heat Tracing (*coordination only)



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5- FLARE GAS TO POWER

Flaring of associated gas from oil wells and excess gas from gas processing facilities and oil refineries is a key and most critical sources of greenhouse gas emissions to the atmosphere

Key Features

- Use of waste by-product of the crude oil production.
- Independent, on-site power supply.
- High profitability with overall efficiency of up to 44% in the case of power generation only.
- Smooth operation despite fluctuations in composition and impurities (within given limits) in the flare gas.
- Minimizing NOx emissions (methane has 21 times the global warming potential of CO2).
- Small footprint due to compact design.
- Compact containerized solution (fast installation, Plug & Play).

TCS Core Capabilities

- Turnkey Gas Genset power solution (250 kW to 10 MW).
- Design, Sizing, Packaging, Supply, installation & commissioning.
- Operations and Maintenance Contracts.
- Full after-market services for gas engines & generators.

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INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

1- PREDICTIVE ANALYTICS (MAINTENANCE)

2- ASSET PERFORMANCE MANAGEMENT (APM)

3- PLANT DIGITALIZATION READINESS ASSESSMENTS

4- MOR (MOBILE OPERATOR ROUNDS)

5- HMI-SCADA-HISTORIAN

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INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

1. PREDICTIVE ANALYSIS (MAINTENANCE)

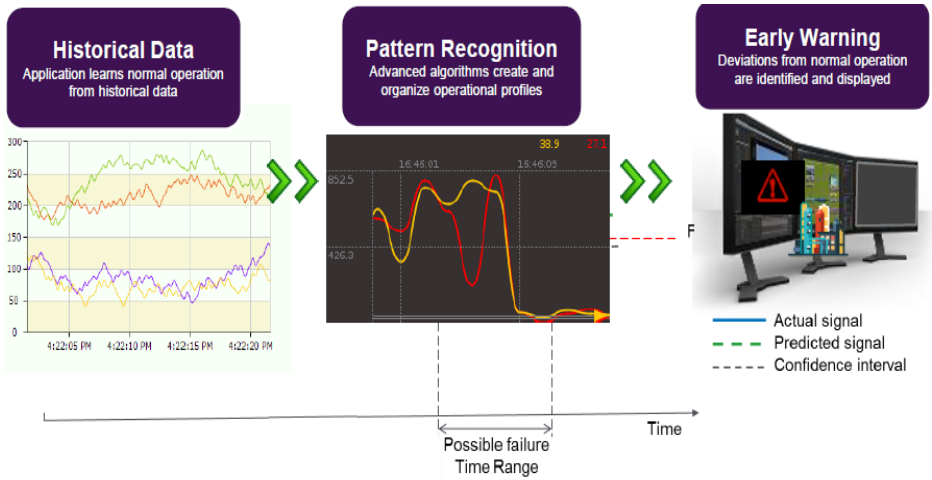
TCS has developed over 700 blueprints (models) for virtually every rotating equipment found in the Power, O&G, Water, Steel, Cement and Mining industries.

KEY FEATURES

- Model based, leveraging advanced pattern recognition
- Uses historical data to describe how a piece of equipment normally operates
- Continuously monitors behavior in real-time
- Transient conditions (e.g., Startup and shutdown of Gas Turbine, Mill, etc.) anomaly detection
- Alerts when the operation differs from the historical norm
- Early warning detection of equipment problems
- Online asset health and performance monitoring
- Advanced analysis capabilities including problem identification and root cause analysis

PREDICTIVE ANALYSIS-ARCHITECTURE

PREDICTIVE ANALYSIS-COAL FIRED POWER PLANT (EXAMPLE)



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INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

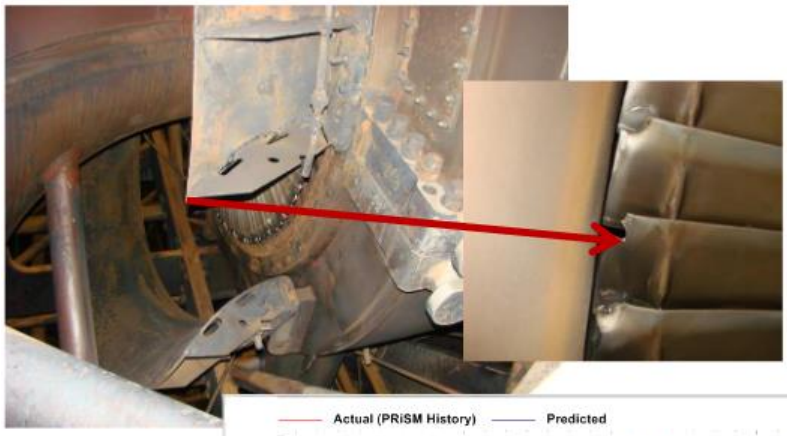
PREDICTIVE ANALYSIS- CASE STUDY

Observations

- Unit started after an outage.
- Vibration step change on a LP turbine.
- Notified Engineering & Plant.
- Vibration data was collected & unit stopped for inspection.
- Bolts on lower half of flow sleeve broke & flow sleeve contacted L-0 blades.

Result

- Upper half of flow sleeve was no longer supported by lower half
- Avoided damaging multiple stages of blades, packing and diaphragms
- Est. Cost Avoided: **$4.1 million USD**



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INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

2- ASSET PERFORMANCE MANAGEMENT (APM)

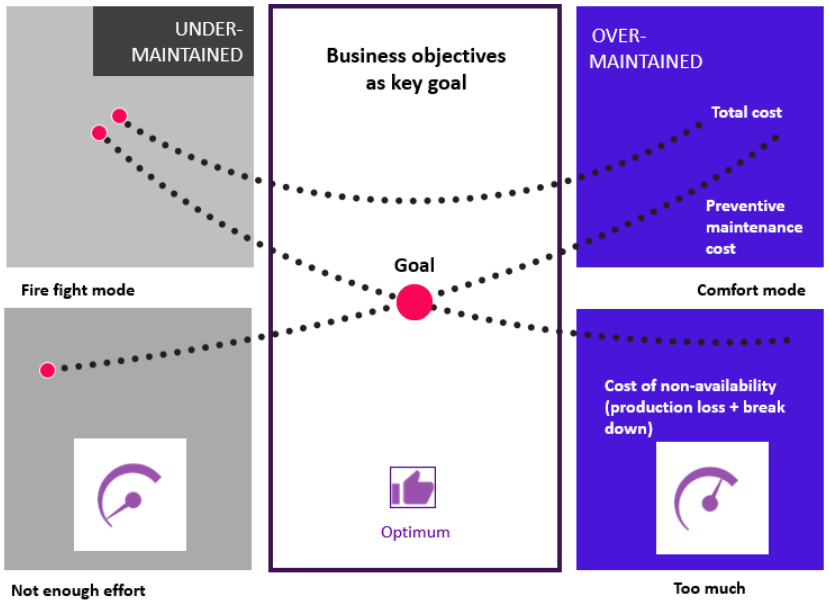
Asset Strategy is the collection of **prescriptive actions** to address the **failures of an asset** when operating **within design specifications** (operating envelope).

Why define an asset strategy?

The goal is to be pro-active instead of reactive

↑ Reliability & safety ↓ Risk of operation ↓ Cost of operation

↑ Operating performance (uptime, quality etc.)



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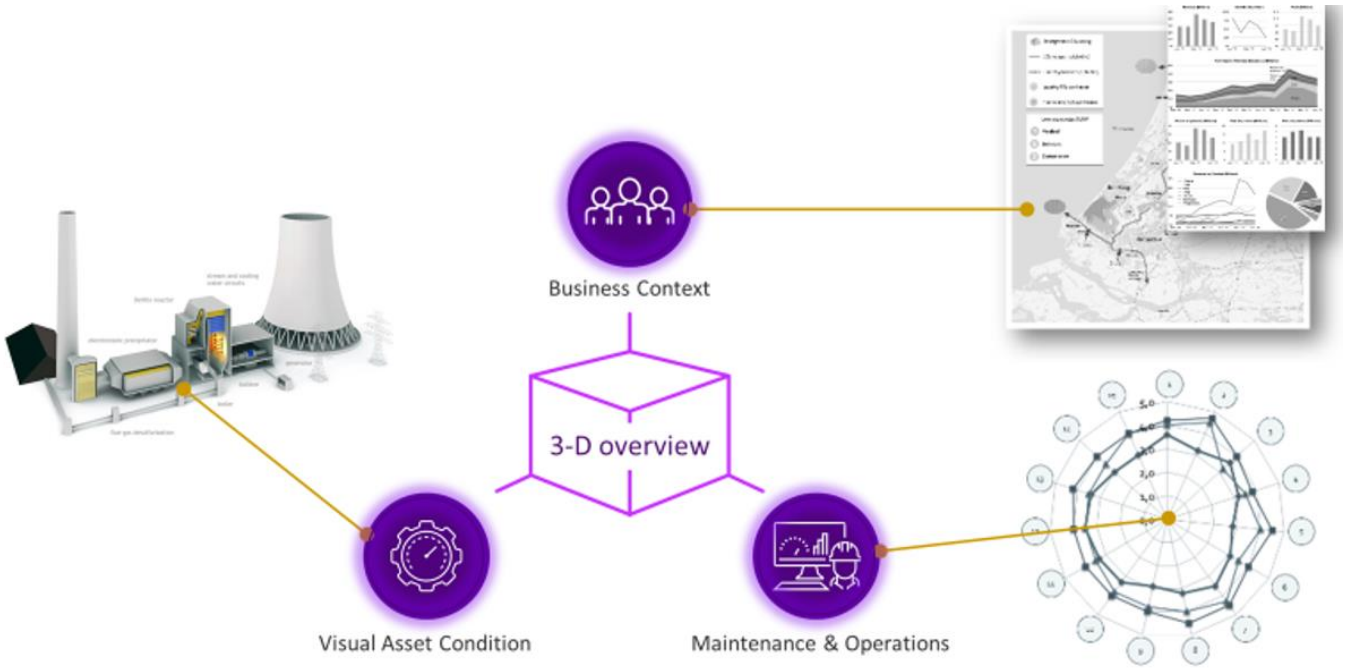
INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

3- DIGITALIZATION READINESS ASSESSMENT

Digitalization-readiness assessment serves as the steppingstone for any plant digitalization initiative, and the main purpose and expected outcome is to determine where this power plant, gas plant, refinery, mining site, etc. is in the maturity curve.



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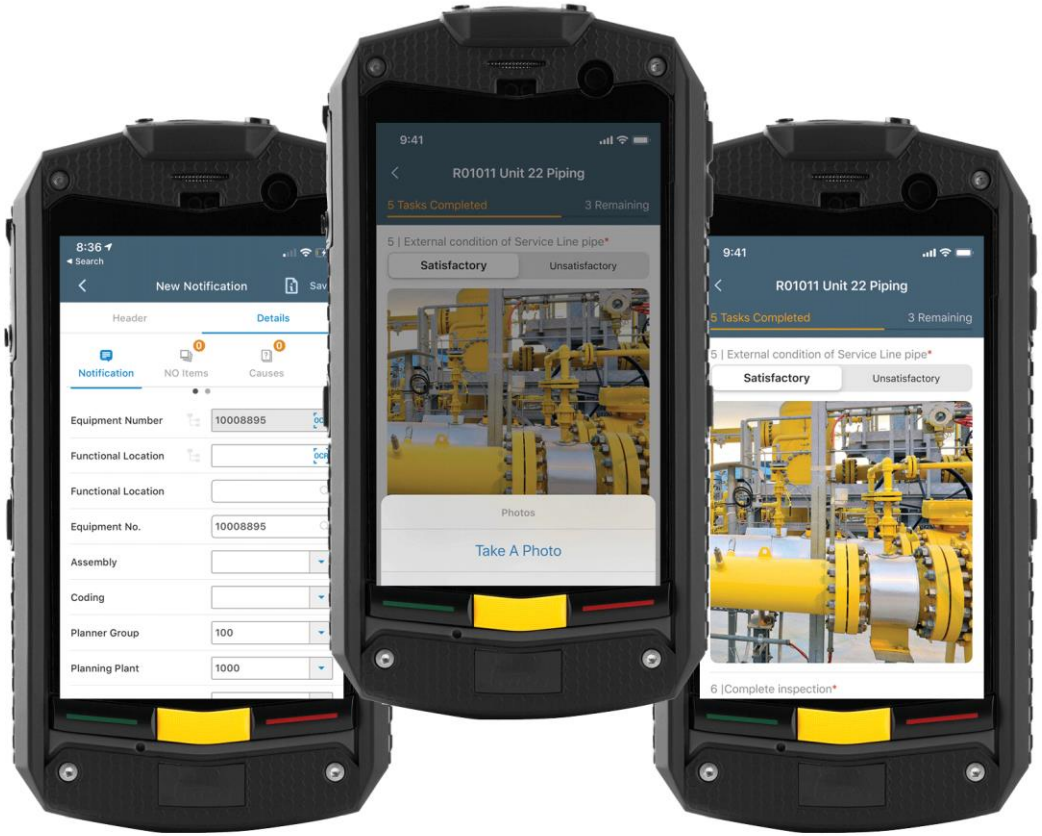
INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

4- MOBILE OPERATOR ROUNDS (MOR)

MOR is a key component of a complete plant intelligence solution that connects all your wired and stranded assets – enabling an even broader visibility into the performance of your assets than ever before. MOR asset-centric approach makes tracking asset performance straightforward.



Why MOR?

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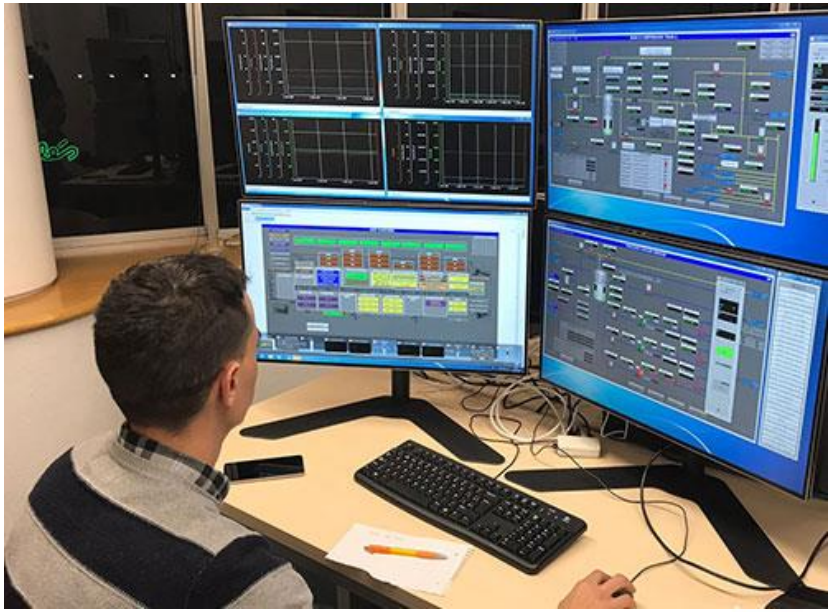
INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

5- OPERATOR TRAINING SIMULATOR (OTS)

Operator Training Simulator (OTS) is an advanced, Hi-Fidelity computer-based training solution that help control room operators learn the skills they need to run a plant safely, efficiently, and profitably. The simulator uses identical application software for the HMI and control as the actual plant, regardless of the OEM

What we offer:

- A real time reproduction of process and control
- The use of the existing plant human machine interface (HMI) in the control room
- Fully functional operator screens and navigation
- Actual site-specific software
- Editors for application software and screens
- Simulation with snap, restore, freeze, and initial conditions functionality
- Alarm management tools
- Trending tools
- Trip history
- Adjust tuning constants
- Software block libraries and documentation
- Watch windows to organize and export data



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INDUSTRIAL DIGITALIZATION (DIGITAL SOLUTIONS)

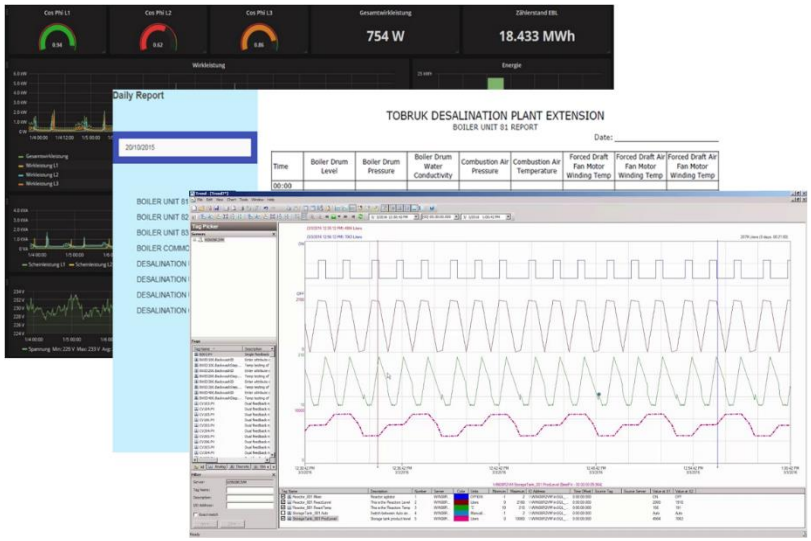
6- HMI-SCADA-HISTORIAN

Why Upgrade?

Old installations are currently running on outdated, unsupported operating systems causing a dramatic reduction in the availability and reliability of operators' assets and drastically increase maintenance costs.

What we offer

TCS offers plant level and enterprise level historian solution with as many as 1000,000 datapoints regardless of the data generating source, i.e., unit Control system, DCS, Smart sensors, PLC, etc. with automated reporting and KPI dashboarding tools.



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SERVICES

1. PLANNED & UNPLANNED MAINTENANCE
2. SYNCHRONOUS GENERATOR
3. PLANT RELIABILITY COMPASS PROGRAM
4. REPAIR & OVERHAULING (ELECTRONIC CARDS, FUEL VALVES & NOZZLES)
5. TRAINING
6. SPARE PARTS

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SERVICES

1- PLANNED & UNPLANNED OUTAGES

- Technical Direction during Installations, Overhauls, Upgrades, Inspections, etc.
- Specialists for Unit Assessments, Failure Root Cause Analysis & Upgrade Recommendations
- Scheduled/unscheduled Outages and Inspection Planning
  - CI, BI, HGPI & MI
  - Generators/Steam Turbine Major or Minor inspections.
- EX-OEM Gas & Steam turbine Mechanical, Control & Instrumentation experts, Field Engineers etc.

SN	Description	Frame 5	Frame 6	Frame 9E	Frame 9 FA
1	Combustion Inspection	07	10	11	04
2	Boroscopic Inspection	85	22	48	06
3	Hot Gas Path Inspection	11	18	12	10
4	Major Inspection	36	14	08	04

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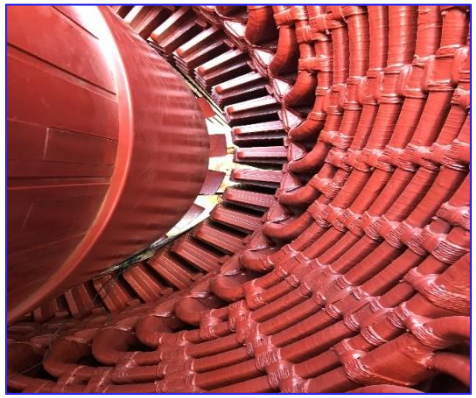
SERVICES

2- SYNCHRONOUS GENERATORS

TCS Offered Services:

- Generator Minor Inspection:
- Generator Major Inspection.
- Online Predictive Maintenance (Anomly Detection).
- Testing & Analysis.
- Partial Discharge Monitoring.
- AVR-Protection Calibration & Testing.



Testing and Analysis

- Insulation resistance,
- Oil analysis,
- RSO (Recurrent Surge, Oscillation) testing,
- Partial discharge,
- EL CID (Electro Magnetic Core Imperfection, Detection),
- Tan Delta testing,
- TVA (Tennessee Valley Authority) probe testing,
- Vibration Analysis & balancing,
- Thermal Imaging

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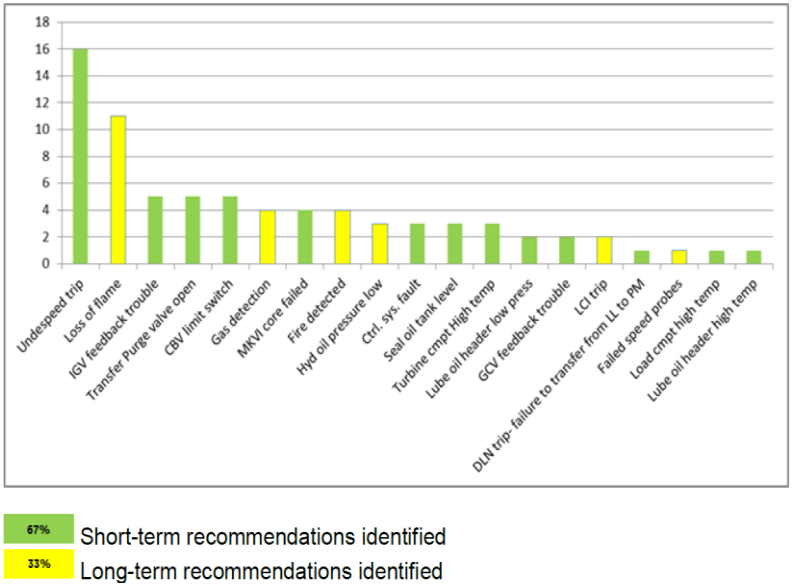
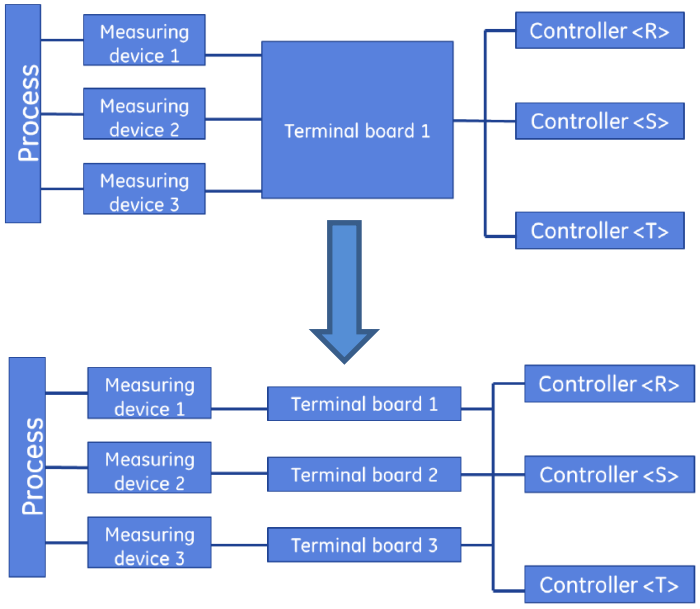
SERVICES

3- PLANT RELIABILITY COMPASS PROGRAM

Key Features:

- Developed by TCS Engineers with a 60+ years of combined experience.
- It significantly improve the plant reliability, availability and minimize downtime.
- It starts with a power plant thorough engineering evaluation on both hardware and software levels.
- It covers every single aspect of the plant core equipment (turbines, generators, compressor, gearboxes, etc.).
- It also covers the auxiliary and supporting systems such fuel systems, lube oil system, cooling & ventilation system, instrumentation, wirings, terminations, power supplies, and control system hardware configuration and the core control logic application.
- A final report is issued with findings and recommendations to implement.
- Spurious and avoidable trips can be reduced by 30% to 60%.





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SERVICES

4- REPAIR & OVERHAUL (ELECTRONIC CARDS, FUEL VALVES & NOZZLES)

ELECTRONICS REPAIR

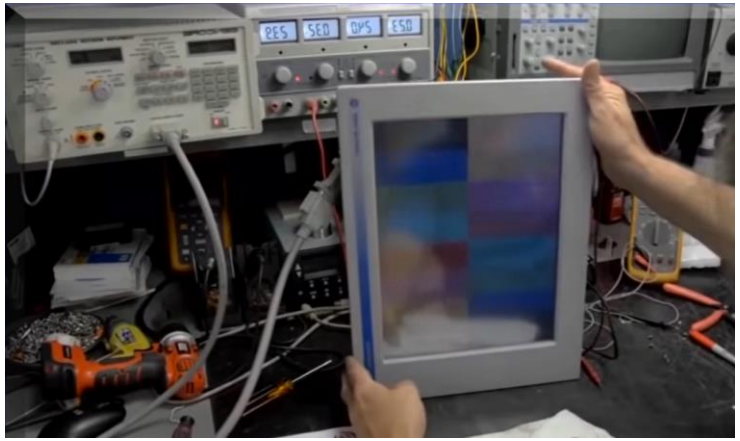
1- GE SPEEDTRONIC MK V, VI, VIE

2- WW MICRONET+

3- PLC AB, SIEMENS, Etc.

4- VFDs AB, ABB, SIEMENS, ETC.

5- OTHERS



FUEL VALVES - NOZZLES

1- GE SRV/GCV (F5,6,7,9)(LM2500/6000)

2- GE LIQ. FUEL VALVE, FLOW DIVIDER

3- GE IGVs, BLEED VLV, CHECK VLVs

4- ST VALVES, ACTUATORS

5- OTHERS

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SERVICES

4- REPAIR & OVERHAUL (FUEL VALVES & NOZZLES)-REFERENCE CASE

GE Gas Fuel Valves (SRV/GCV)

Procedure:

1. Receive at the TCS workshop facility
2. take photos of the as received condition
3. Take an inventory of the incoming job and raise a traceable job #
4. Carefully disassemble the unit, taking photographic evidence
5. Clean all of the components using correct not damaging techniques
6. Carry out complete Inspection of all internal and external components
7. Generate Initial inspection report summarizing all findings.
8. The initial inspection report will be submitted to the customer.
9. When customer confirmation is received, TCS will do relevant repair scope as mentioned on the initial inspection report – Including:

- **Procure & replace parts from our internal stores or trusted suppliers.**
- **Inspection of all new replacement parts, re-check and carry out any sub assembly tests.**

10. All new parts are QC inspected, TCS carry out the reassembly of the
11. Test the assembly on the hydraulic test rig following the test sheet which is referenced to the G.E test specification.
12. TCS will submit a final customer report along with a test data sheet.
13. The finished assembly with be painted with corrosion resistant paint.
14. The finished assembly with be Inhibited and packaged in accordance with the length of storage.
15. A final quality assurance check will be carried out and the customer notified of collection/delivery.

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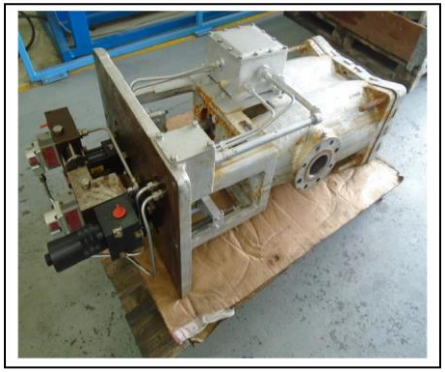
SERVICES

4- REPAIR & OVERHAUL (FUEL VALVES & NOZZLES)-REFERENCE CASE

GE Gas Fuel Valves (SRV/GCV)

Original component condition: Pic 1)



New component condition: Pic 1)

Pic 2)

Sub-assembly rebuild condition: Pic 5)

Pic 6)

New component condition: Pic 3)

Pic 4)

Sub-assembly rebuild condition: Pic 7)

Pic 8)

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SERVICES

4- REPAIR & OVERHAUL (FUEL VALVES & NOZZLES)-REFERENCE CASE

GE Gas Fuel Valves (SRV/GCV)

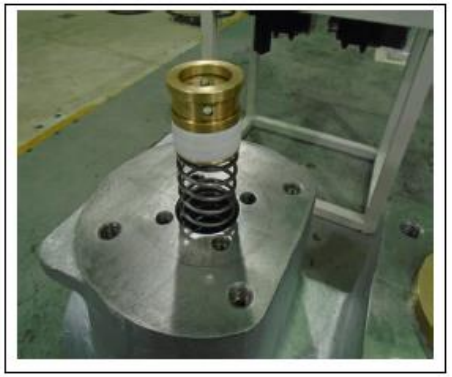
Valve assembly: Pic 11)

Pic 12)

Valve assembly: Pic 15)

Pic 16)

Valve assembly: Pic 13)



Pic 14)

Valve reassembly: Pic 17)

Valve reassembly: Pic 18)

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SERVICES

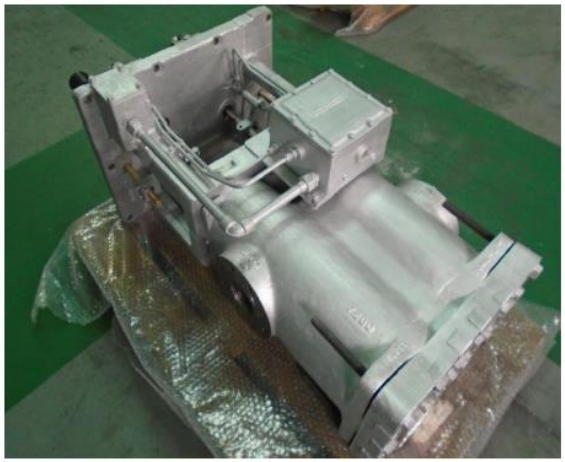
4- REPAIR & OVERHAUL (FUEL VALVES & NOZZLES)-REFERENCE CASE

GE Gas Fuel Valves (SRV/GCV)

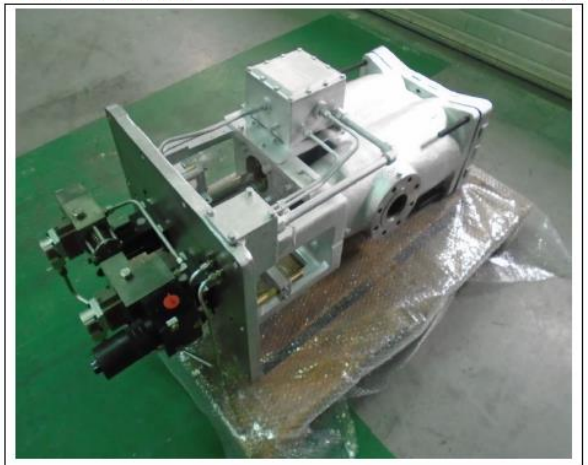
Valve assembly testing: Pic 19)

Valve assembly testing: Pic 20)

Completed valve assembly: Pic 21)



Completed valve assembly: Pic 22)



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SERVICES

5- TRAINING PROGRAMS

TCS OFFERS FOLLOWING COURSES

- Gas Turbine Operations/ Maint. (GE Speedtronic Mk V, VI, Vie Controls)
- GE Speedtronic Mark V, VI, Vie Maintenance/Trouble Shooting
- Steam Turbine Operation & Maintenance
- Siemens Control System (Teleperm ME, TXP, T3000, PCS7)
- Woodward Control System (Netcon5000, Atlas PC, Micronet Plus)
- Invensys Controls (Foxboro DCS, Triconex ESD, Wonderware HMI)
- Simplicity HMI Operation and maintenance

KEY HIGHLIGHTS

- Delivered training to over 5000 engineers, operators, maintenance personnel to educate and enhance skills
- Flexible logistics – hold training at our Training Center or bring classes to our client
- Specialist training packages customized to clients needs
- Well experienced instructors

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SERVICES

5. SPARE PARTS SUPPLY:

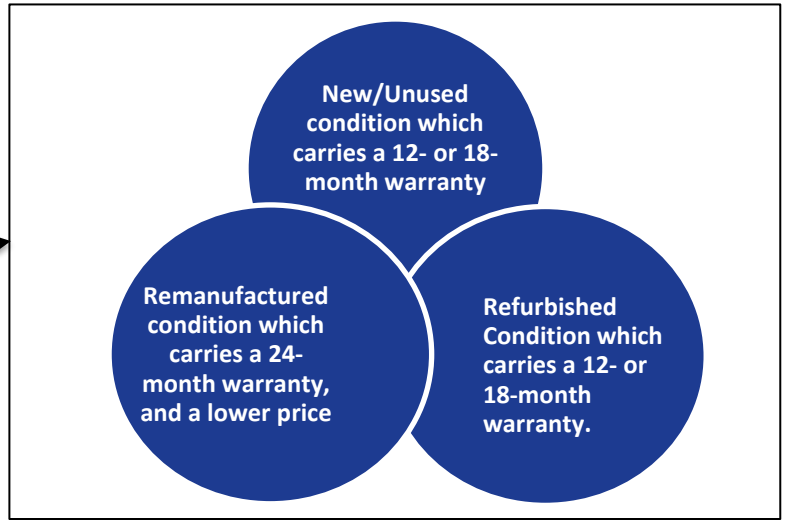
Multimillion-dollar inventory of GE Speedtronic, ABB, Woodward's MicroNet & Siemens parts.

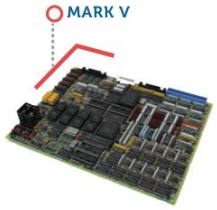
Genuine OEM parts that have been obsoleted or "sunsetted" by the OEM.

Why buy from us?

Full control cards diagnostics and repair capabilities.

Test with Certification Parts supplied or refurbished are fully tested in a live panel before shipment.





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SERVICES

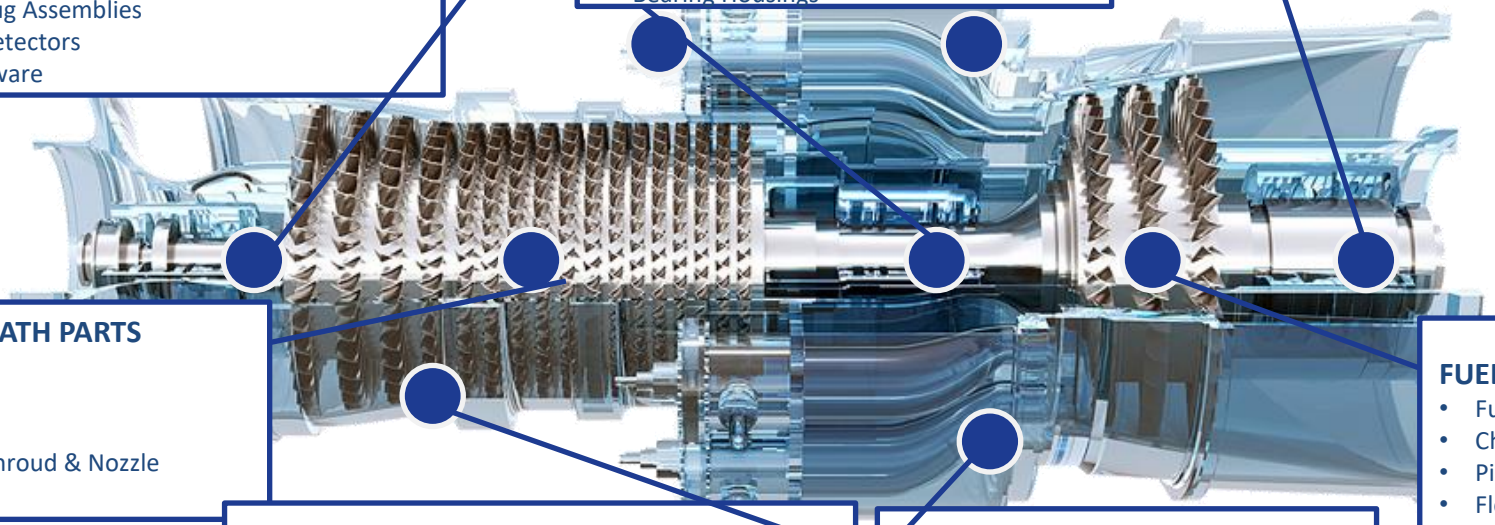
5. SPARE PARTS SUPPLY:

Mechanical Spares (GE HD & Aero turbines)

COMPRESSOR PARTS
- Compressor Rotor & Stator Blades
- Inlet Guide Vanes
- Rack & Ring Assemblies
- IGV Gears & Bushings
- Shims, Keys & other associated hardware

COMBUSTION SYSTEM & HARDWARE
- Combustion Liners
- Transition Pieces
- X-Fire Tubes & Retainers
- Flow Sleeves
- Combustion Cans
- Spark Plug Assemblies
- Flame Detectors
- TP Hardware

BEARING ASSEMBLY & HARDWARE
- Thrust Bearings
- Bearing Liners
- Oil Deflectors
- Various Hardware
- Bearing Housings



HOT GAS PATH PARTS
- Buckets
- Nozzles
- Shrouds
- Bucket, Shroud & Nozzle Hardware

FUEL SYSTEMS
- Fuel Nozzles
- Check Valves
- Piping
- Flow Dividers
- Fuel Pumps

TURBINE CASINGS AND EXHAUST FRAMES
- Inlet Bell Mouth
- Compressor Casings
- Compressor Discharge Casings
- Turbine Casings
- Exhaust Frame Assemblies & Diffusers
- Bearing Housings

INLET AND COMPRESSOR CASINGS
- Inlet Bell Mouth
- Compressor Casings
- Compressor Discharge Casings
- Turbine Casings
- Exhaust Frame Assemblies & Diffusers
- Bearing Housings

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Our Clients

GE Energy

PETRONAS

GECOL
الشركة العامة للكهرباء

LTL HOLDINGS

AES
Kelanitissa

POWERTEK

SESB

Pratt & Whitney
A United Technologies Company

KAPAR ENERGY

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Our Clients

Shell

CEYLON ELECTRICITY BOARD Enrich Life through Power

MEGAWATT Electrical Trading Co. LLC

NUR power

wintershall

مليته للنفط والغاز
Melitah Oil & Gas

PT. PLN (PERSERO)

الهروج للعمليات النفطية
HAROUGE
OIL OPERATIONS

Sirte Oil Company