CPM
Condition and Performance Monitoring
Condition and Performance Monitoring (CPM) is a surveillance system designed to maximise production uptime and maximize asset availability. Having qualified and continuous updated knowledge about the integrity of your subsea asset is of utmost importance for making the right decisions at the right time in terms of maximizing profitability of the reservoir development.

CPM system and services provides a proactive monitoring of the subsea production and processing systems, and a 24/7 collaborative expert environment for diagnosis and problem solving.

- **Analyze and diagnose**
  Early detection of reduced efficiency and integrity will increase system availability.

- **Proactive and Condition Based Maintenance**
  Plan ahead to maximize intervention efficiency to obtain the ultimate reservoir recovery.

- **Decision Support**
  Strengthen available resources and competence.

- **Historian Database**
  Extensive and complete historian database. Improved decision base and faster turnaround in trouble shooting.

- **Complete Suite of Life of Field Services**
  Single Point of Contact (SPOC), Unified Services Management, Condition and Performance Monitoring and Flow Management.

To maximize production and minimize operating cost the solution is continuous surveillance throughout life of field. Early warning of potential failures offers the potential for increasing equipment efficiency and instigate planned maintenance vs. unplanned. Recognizing and understanding equipment condition, based on performance trends will help avoid costly unplanned repairs.

- Trust your sensors. Statistical analysis will indicate if your sensors are reliable.
- Proactive use of built in redundancy to avoid fail-safe shut-down.
- Replace chokes when you know erosion is beginning to compromise the controllability of the flow through the choke.
- Detect and locate subsea leakage in the hydraulic system.
- Understand your valve performance. Real-time analysis of hydraulic- and electrical torque signatures will reveal the true health of subsea valves.
- Have necessary data readily available from an extensive and complete historian database when trouble shooting.
- Subsea processing and rotating machinery. Detect reduced efficiency and integrity. Tune processing system to be able to run uninterrupted until next planned maintenance campaign.

- **Data Acquisition**
- **Real-time Processing**
- **Early Warning**
- **Collaborative Problem Solving**
- **Maintenance and Intervention**
- **Knowledge Management**
Condition and Performance Monitoring

**SENSOR & INSTRUMENT INTEGRITY**
- Single sensor validation
- Redundant sensor validation
- Model based validation

**VALVE PERFORMANCE**
- Hydraulic and electrical signature analysis

**SUBSEA PROCESSING SURVEILLANCE**
- Subsea compressor
- Multi phase pumps
- Separator internals
- Cooler

**SPCU AND HPU**
- Communication
- Power & hydraulic distribution
- SCM

**HYDROCARBON LEAKAGE**
- Detect and alert

**FMC DATA COLLECTOR**
- Access to all real-time subsea data
- Historian database for subsea data
- Event log
- SIL Documentation support

**CHOKE SURVEILLANCE**
- Cv estimation
- LVDT Integrity
- Sandload
- Erosion model
- Command log

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Complementing the operators’ surveillance processes

Monitor and report
- Online monitoring of asset integrity
- Identify abnormal trends in development
- Collaborate and discuss in periodic meetings
- Online up-to-date status reports

Diagnose, advise and alert
- Perform situation analysis and diagnosis
- Collaborative problem solving
- Readily access to expert network
- Planning for intervention and maintenance

Recover and maintain
- Execute intervention and maintenance
- Update subsea configuration database
- Data warehouse of historical data

Knowledge Management
- Knowledge database
- Continuous product improvement
- Report product experience

Technical Condition Index

The CPM system takes integrity monitoring beyond traditional Key Performance Indicators (KPI) by taking a holistic approach and utilizing all available data and information, where criticality, system experience and operating philosophy is modeled and built into the Technical Condition Indices (TCI).

TCI: Subsea Control Module (SCM)

TCI technology is built on three cornerstones:
- TCI’s as mathematical models describing the behavior of a particular subsystem
- A hierarchical tree model of the subsea production facility where each node in the tree is assigned one or more TCIs
- TCI aggregation principles defining the impact of each TCI to its parent level

TCI enables the user to detect problems before they develop, and equally important, determine how severely it impacts production and system availability. The technology utilizes existing instrumentation. It is therefore equally suitable for both new and mature fields.

By modeling each TCI, assigning weights, building the hierarchic model and defining the aggregation rules, the CPM system and service is encapsulating the in-depth knowledge about the subsea production facility, making CPM an excellent tool for decision making.