CMMS & SCADA
Condition-based maintenance

SCADA Intro
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SCADA/CMMS Interfaces
Real-World Applications
SCADA Intro

SCADA - Supervisory Control And Data Acquisition

A system that collects data from various sensors at plant and sends this data to a central computer to interpret.

- GE Intellution/ ifix
- Wonderware InTouch
- Allen-Bradley RS View
A programmable logic controller (PLC) is communicating with a pump’s flow meter.

A SCADA system acts as an HMI (Human machine interface), allowing operators to view and change flow meter settings via the PLC.
Palm Bay RO Water Treatment Plant
Sulfuric Acid Feed System

3.7 Blended pH

7.3 Feed pH

5.0 Ft Bulk Tank Level

2.1 Ft Day Tank Level

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<th>Date In</th>
<th>Time In</th>
<th>Tagname</th>
<th>Description</th>
<th>Status</th>
<th>Value</th>
<th>Area</th>
<th>Node</th>
<th>Priority</th>
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<tbody>
<tr>
<td>1/2/2006</td>
<td>10:21:01:25</td>
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<td>RO Blended Water Low pH</td>
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<td>PEROSC</td>
<td>LOW</td>
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</table>
## PALM BAY RO WATER TREATMENT PLANT
### Blend Water Filters

**Blended Conductivity:** 130.9 umhos

**Blended pH:** 3.7

**Low Low pH**

**0.0 PSID Blend Water DP**

**Low Low Diff Pressure**

**Closed**

**HQA Auto**

**0 GPM Blend Flow**

**Flow Totals**

---

**To: RO Feed Water Filters**

**TO DEGASIFIERS**

---

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CMMS & SCADA
Condition-based maintenance

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CMMS Intro

- CMMS typically use calendar-based preventive maintenance
# CMMS Intro

## Calendar-based vs. Runtime-based

### Calendar-based
- General Genset Inspection
- Check Coolant Heater
- Check Oil Level
- Check Coolant Level
- Check Fuel Level
- Check Charge Air Piping
- Check Air Cleaner (Clean if required)
- Check Battery Charging System
- Drain Water and Sediment from Fuel Tank
- Drain Exhaust Condensate Trap
- Check Starting Batteries
- Change Air Cleaner Element
- Check Radiator Hoses for Wear & Cracks
- Test Generator Insulation Resistance
- Grease generator bearing (P7)
- Drain Fuel Filter(s)
- Check Anti-freeze and DCA Concentration
- Change Crankcase Oil and Filter
- Check Drive Belt Tension
- Change Coolant Filter
- Clean Crankcase Breather
- Change Fuel Filters
- Clean Cooling System

### Runtime-based
- See Engine Schdl.
- Daily or after 8 Hours
- Monthly or after 100 Hours
- 6 Months or after 250 Hours
- Yearly or after 500 Hours
- 4000 – 4500 Hours

*Table of maintenance items and their respective service times.*
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CMMS & SCADA

- SCADA software can deliver signals indicating the status of equipment or systems and corrective work orders can be raised based on the data received.
CMMS & SCADA

Flow Meter

Pump

PLC

SCADA

Workers Informed

CMMS
Why not rely solely on calendar-based preventive maintenance?

- **Inadequate maintenance**: A “Weekly or 50 hours” PM is generated every week - but runs 100 or more hours per week
- **Wasting money**: A “Weekly or 50 hours” PM is generated every week but only runs about 50 hours a year

With many integrations - alarms for high chlorine level, pump failure, high level, low flow etc. can automatically generate a CM work order.

Leading to:

- Reduction in human error
- A more standardized process
- An increase in equipment uptime
- Reduced cost in the long-run
CMMS & SCADA

Condition-based maintenance

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SCADA/CMMS Interfaces

- Direct SQL link
- Manual input
- Historical data CSV interpretation
Direct SQL Link

Treatment Plant Automatic Data Collection Points:
- Plant Flow Totalizer
- DC Meter
- pH Meter
- RAS Flow
- Chlorine Meter

SCADA Collected Data

Selected data is transferred from the SCADA system to the Operator10 database via the DDE interface application. This information is then used for reporting and process control.

Operator10 Workstations

Network Server

Network Printer
Direct SQL link (Wonderware Intouch)

- In this example, a reading of the “Effluent DO” meter is taken 24 times per day (every hour)

  Data can be exchanged with any running application that supports OPC/DDE linking using the ASCII text format.

  Examples are:
  - Microsoft® Excel®
  - Microsoft Access®
  - Microsoft Word®
  - FactoryLink®
  - Wonderware®
  - InTouch®
  - LookOut®
  - Intellution Fix®
  - Citect®
  - RSLinx®
  - FMT

- The readings are placed in the database location “Plnt Ef” (Plant Effluent) for parameter 00300 (Disolved Oxygen). When a reading surpasses a user-defined high or low, a work order is generated.
SCADA/CMMS Interfaces

- Direct SQL link
- Manual input
- Historical data CSV interpretation
1. Declare maintenance intervals

<table>
<thead>
<tr>
<th>Location</th>
<th>Hubble Southfield CSO Basin</th>
<th>Sched #</th>
<th>10:00</th>
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<tr>
<td>Area</td>
<td>RS</td>
<td>WO Status</td>
<td>1</td>
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<tr>
<td>Asset</td>
<td>5S401</td>
<td>New Record</td>
<td></td>
</tr>
<tr>
<td>Component</td>
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<table>
<thead>
<tr>
<th>Mult.</th>
<th>Hours</th>
<th>Techs</th>
<th>C Days</th>
<th>Pri.</th>
<th>Shift.</th>
<th>Task Code</th>
<th>Task Description</th>
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<tbody>
<tr>
<td>A:</td>
<td>500.00</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td>PW5X0M1TY</td>
<td>Flushing water Strainer PM</td>
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<tr>
<td>B:</td>
<td>0</td>
<td>1,000.00</td>
<td>2</td>
<td>0</td>
<td></td>
<td>PW5PM-1RY</td>
<td>Flushing Water Pump Motor PM</td>
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<tr>
<td>C:</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D:</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0</td>
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</table>
Perform routine inspections
Manual Input

3. Work order enters queue once “Asset Total” surpasses “Levels- Hours”
Manual Input

4. Work order is generated and distributed

![Work Order Image]
SCADA with CMMS Interfaces

- Direct SQL link
- Manual input
- Historical data CSV interpretation
Historical data CSV interpretation

JOB Plus with Wonderware SCADA –

1. Intouch (by Wonderware) writes daily values to a “HistData” comma separated values (csv) file.
2. JOB Plus reads and interprets the csv file
3. JOB Plus summarizes that data based upon user-defined statistics and places summarized values into the “meter” field
4. When the “meter” field value goes beyond an upper or lower bound- a work order will be generated
Historical data CSV interpretation
Real-world applications

Preventive Maintenance:
- Runtime hours
- Low flow

Corrective Maintenance:
- High level
- High gas readings
When the runtime hours surpass “500” hours, a PM will be generated to lubricate bearings and check amperage and voltage draw.

When the runtime hours surpass “1000” hours, a PM will be generated to lubricate and inspect drive line.
Low flow

The RO membranes should be cleaned whenever permeate flow drops 10% below its initial flow rate.

Once permeate flow drops by 10%, a PM is automatically generated to flush the RO membranes.
Once chlorine gas levels approach dangerous levels, a CM is generated to inspect supply and exhaust fans, tubing, chlorine storage tanks, etc.
Low DO readings

When DO readings drop below an acceptable level, a CM will be generated to check rotors, solids level, and potential IPP issues.
CMMS software with built-in SCADA integration

- Maintenance Connection Onsite/Online 2.5
- TabWare EFX EFXoo
- Infor EAM Asset Sustainability Edition 8.3
- Avantis.PRO 4.1
- Oracle Utilities Work and Asset Management 1.7.15.2
- FaciliWorks 8i
- IBM Maximo Asset Manager 7.1
- Lawson Enterprise Asset Management (EAM)
- IFS Applications 7
- Ivara SuprEAM 5.0
- Jobcal
- Bigfoot CMMS Internet/Enterprise Edition 8.0.1 – No
- MaintiMizer 4.0 - No
- Cityworks 4.5- No
- ePAC- No
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