Remote Monitoring System (RMS) for Cathodic Protection

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# Table of Contents

1. Cathodic protection system
2. Need for RMS
3. Introduction for executed PJT
4. RMS system feature
5. Actual operating at site
6. Summary
1. Cathodic Protection System

• Cathodic Protection is an electrical means of corrosion control where the structure to be protected is made into cathode in an electrochemical corrosion cell.

• To achieve above definition, certain amount of D.C. current shall be applied externally by mean of;

  - More active metal(s) (Sacrificial anode system)
  - DC power source with stable metal(s) (Impressed Current System)
1. Cathodic Protection System

What is Cathodic Protection

- A Cathodic Protection System is composed of;
  - Anode / Cathode
  - External DC power supply (Impressed Current System)
  - Cable and wires
  - Test facilities

- Cathodic protection system is usually applied for;
  - Cross country pipelines
  - Storage tanks, vessels and drums
  - In plant piping
  - Reinforcing rebar in a concrete structures
  - Any metallic structures contact with soil and water
1. Cathodic Protection System

Monitoring of C.P. System

- Readings and data to be monitored routinely
  - Potential of structure (natural / On / On & Off)
  - Tr/rectifier operating status (Input / Output)
  - Other data required

- Difficulties for above monitoring activities
  - Remote or difficult to access
  - Hazardous environments
  - Lack of resources (Skilled personnel, equipment and time)

Improperly executed monitoring, maintenance and incorrect operation of CP systems may result in lack of protection and may damage facilities.
2. Need for Remote Monitoring System (RMS)

- Advanced communication and internet technology can be a reliable data transferring method in CP field on a real-time basis.

- Clients want more effective use of personnel resources to achieve timely and targeted maintenance tasks.

- Benefits of properly designed and applied RMS
  - give operators accurate data on a real-time basis
  - can record and sort historical data for trend analysis easily
  - give automated reporting and alarm to operators
  - can access RMS anytime, everywhere (Remote client access)
  - reduce operators’ exposure to hazardous environments
  - reduce monitoring and maintenance cost
3. Introduction for Executed Project (CP)

Project Title: Boubyan Seaport Project Phase 1-Stage 2
Location: Boubyan Island, Kuwait
Scope: Design, Material and Installation & Maintenance
Client: Ministry of Public Works
3. Introduction for Executed Project (CP)

<table>
<thead>
<tr>
<th>Sea Part (P1)</th>
<th>Land Part (P2)</th>
<th>Concrete Part (P3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Steel Pipe (Φ2,540)</td>
<td>- Steel Pipe (Φ2,540)</td>
<td>- Re-bar in Capping Beam</td>
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<tr>
<td>- Sheet pile</td>
<td>- Steel Pipe (Φ1,575)</td>
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<tr>
<td>- Fender, Ladder</td>
<td>- Tie Rod</td>
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</tbody>
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Tubular Anode

Mesh Ribbon Anode
3. Introduction for Executed Project (CP)

Host PC  Sea Part

Land Part

Concrete Part

-> Fiber Optic
-> Converter(E-316MC)
-> Tr/Rectifier
4. RMS System Feature

- Manufacturer: Samgong, Korea
- Input Voltage: 3Φ 415V 50Hz
- Output Voltage: DC 10V ~ 50V
- Control Method: μ-processor direct control
- Constant current / voltage / potential mode
- Ripple & Noise: ±3%
- Efficiency: greater than 60%
- Power factor: greater than 80%
- Set point accuracy: less than +1 %
- Temperature drift: less than +0.02%/°C
- Serial port: RS 232, Ethernet port: RJ45
- Remote monitoring and control from the control room
- Remote client access
- Built in synchronized current interrupter
- Network management system (RMON)
4. RMS System Feature

**Main Control Unit**

- Operation status display (Run/Stop)
- Operation Voltage/current/Potential Display
- Local control is available
- Max. 12 units can be accommodated in a cabinet
- RJ45 Port for data communication

**Host PC**

- Intel Zeon processor
- Memory : 8 GB
- Screen size 23 “ LED
- Response Time : 5ns
- Brightness : 250cd
- Input terminal : D sub/HDMI

- MS window server
- HDD : 1 T
- Resolution : 1920 x 1080
4. RMS System Feature

- **RJ45 ports**
  - 10/100BaseT(X) auto negotiation speed, Full/Half duplex mode, and auto MDI/MDI-X connection

- **Fiber ports**
  - 100BaseFX ports (SC/ST connector)
  - Mode: Multimode
  - Input Voltage: 24V DC
  - Input Current: 0.26A
  - Dimensions: 53.6 x 135 x 105 mm
  - Weight: 790 g
  - Operating Temperature: -40~85°C
  - MTBF: 255,000 hrs
5. Actual Operation at Site

Main menu for area selection

Tr/Rectifier operation status in a selected area
5. Actual Operation at Site

Operation status of single unit on real time basis

Historical potential profile graph
5. Actual Operation at Site

*Excel Export Format*

- Data exporting menu
- Exported data to MS Excel

- Exported data to MS Excel
5. Actual Operation at Site

Polarized potential measurement by built in synchronized current interrupter and data logger
5. Actual Operation at Site

Network set up and management
6. Summary

- CP system can now be remotely controlled and monitored by adopting communication and internet technology.

- For communication between host computer and TR units, switches, UTP cables and fiber optic cables are used together with converter.

- Supplied RMS for Boubyan Project has open architecture for future extension and modification. (MODBUS TCP/IP)

- The RMS system can be accessed in a remote area via internet connection. (Web based monitoring system)

- Network management system (RMON) can efficiently control network traffic.

- The RMS can be optimized and customized for various application.