Webinar On
Execution and Maintenance of LIS

Presentation by
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## Lift Irrigation Schemes Under S.I.C Sangli

<table>
<thead>
<tr>
<th>Name of Scheme / Project</th>
<th>No Of Stages</th>
<th>No Of Pumps</th>
<th>Rising Main no / length Km.</th>
<th>Power Requirement ( HP )</th>
<th>I.P. ( H.a)</th>
<th>Utilisation TMC</th>
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<tbody>
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<td>Takari Scheme</td>
<td>4</td>
<td>39</td>
<td>8/15.23</td>
<td>54184</td>
<td>34397</td>
<td>9.34</td>
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<td>Mhaisal Scheme</td>
<td>7+5 LIS</td>
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<td>25/44.73</td>
<td>113681</td>
<td>82922</td>
<td>17.44</td>
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<td>Tembhuh Lift Irrigation Project</td>
<td>5+6 LIS</td>
<td>123</td>
<td>29/90.44</td>
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<td></td>
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<td>283</td>
<td>62/150.4 Km.</td>
<td>368636</td>
<td>229175</td>
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Mhaisal Scheme 3 Lift Irrigation Schemes (6A, 6B, Agalgaon- Jakhapur), Tembhuh Lift Irrigation project 2 Stages (Stage IV, Stage V, 5 LIS & Visapur-2 Punadi-3) have been executed in last 5 years.
Finalisation of LIS Parameter, Layout & Detailed Design

- Proposal sent to CDO by field office incorporating fortnight crop water Requirement as per modified Penman method, proposed layout of scheme.

- On basis of field data received, pumping machinery note inclusive of rising main, pump parameters and general layout prepared by CDO sent to subcommittee members.

- Sub committee meeting

- Chairman SE PH (CDO), SE (Civil), SE (Electrical),SE (Mechanical) meeting held and various controlling levels ( MDDL, POL, FSL, DC(FSL), Pump floor level, Sump Bottom level, Delivery pipe level etc.) Rising main details ( thickness, length ), Pumps ( types, HP, alignment), & electrical voltage are finalised.

- Standing committee

- Standing committee meeting under respective corporation is held and parameters are finalised.
After sanctioning of parameters general layout is prepared at field level and is submitted to CDO Nasik for sanction. After GL finalisation and approval, design of rising main, approach channel, inlet arrangement, pump house, delivery chamber is done and sanctioned at field level.

Mechanical wing finalises the valves in pump house and at start where as other valves on rising main are finalised by CDO. For surge analysis and antisurge arrangements Mechanical wing will process guidance of CDO.

Surge analysis done by authorised technical institute (CWPRS Pune, IISC Bangalore, IIT Mumbai, VJIT as other competent institute) depending on data provided and in consultation with Mechanical wing, Civil wing. Work to be started after finalising the arrangement with CE (Civil).
COMPONENTS OF LIS TO BE EXECUTED BY CIVIL WING

1) Intake Structure.
2) Approach Channel
3) Pump House.
3) Rising main with Manifold
4) Valves
5) Anti Surge System
6) Delivery Chamber
Intake structure & Forebay of Aagalgaon Jakhapur
Tembhu Pump House Stage- IV & Stage - V
Sand Blasting
Gunitting & Internal Epoxy painting
Manifold & Rising main
Air valve & Delivery chamber
Antisurge arrangement – Bladder vessel
Component of LIS to be executed by Mechanical wing

- Bell mouth
- Bowl assembly
- Column pipe and intermediate shaft- (Delivery pipe)
- Shaft, Bearing housing- thrust bearing.
- Motor and pump coupling
- Motor
- Control Panel
- Incomer
- Motor feeder.
- Bus coupler.
- KAV, cooling valves, NRV, BF valves
Vertical Turbine Pump & Submersible Pump
E. O. T. Crane

Valves

- Butterfly valve
- N.R.V.
- Actuator
Component of LIS to be executed by Electrical Wing

1. Outgoing Bay MSEDCL / Transmission line.
2. Point of supply - tapping point (HT connection point)
3. Switch yard
   a) Plot development, foundation, Cable, Trenches, Control room erection (by civil wing)
   b) Power transformer
   c) Circuit Breaker
   d) Current Transformer (CT)
   e) Potential Transformer (PT)
   f) Isolator
   g) Lightening Arrestor
4. Transmission line (in case of connection to other LIS point)
5. Control panel
6. Transmission line tower type / RSJ pole.
7. Power supply cable / bus duct.
Switch yard & Control panel
Transmission line & Transformer
Estimate, Tendering Sequence and Coordination

- Estimation and Tendering of Civil Components.
- Actual start of Execution of Civil Components i.e approach channel, Forebay, Pump house.
- At the same time when Civil works are started, the estimates of Mechanical and Electrical Components shall be ready.
- Tendering of mechanical and electrical components.
- After 50% completion of Civil Components, procurement of mechanical components shall be started.
- Electrical HT line & works of switch yard shall be started.
- Finalization of Surge Analysis.
Surge Analysis study

- After finalisation of tenders of pump, all data pertaining to surge analysis submitted to C.W.P.R.S Pune / I.I.Sc Bangalore/ I.I.T Mumbai/ V.J.T.I Mumbai or any reputed technical Institute. Provision of Training to two Engineers each from C.D.O Nashik (P.H) and Mechanical Organisation.

- Surge Analysis report studied by C.D.O and Mechanical Organisation and submitted to C.E Civil Wing.

- On approval of Field Civil C.E, Estimates Tendering and actual works taken in Hand.

- Anti-Surge arrangements constructed till rising main work is completed.
Co-ordination within Civil, Mechanical and Electrical Wing

Civil wing with Electrical wing.

I. Layout of switch yard for cable trench, Earth matting and Equipment fixing.

II. Foundation loads for foundation design and construction for transformer.

III. Size of control panel.

IV. Regular Monitoring of Number of poles erected.

V. Load sanction process monitoring.

Civil wing with Mechanical wing.

I. Construction up to Gantry level for pump Assembly.

II. Valve position/ Saddle support position, Opening sizes.

III. Embedment’s and Anchorages.

IV. Monitoring of pump procurement and allied equipments.

Electrical wing with Mechanical wing.

I. Motor H.P, Voltage level to be given by Mechanical wing for transformer and switchyard equipment design.

II. Errection of Incomer panel by Mechanical wing for cable/ Bus duct connection.
Execution Methodology

1. Intake Structure, Forebay, Sump
   
   - Approach road to site of pump houses is necessary to carry heavy equipment.
   
   - Construction of Intake Structure, forebay, sump to be carried in non-monsoon / non-rotation period of canal preferably.
   
   - In case where source is from canal, care to be taken to line the canal in vicinity to avoid flooding of sump and hampering activities of pump erection. (Agalgaon Jakhapur case)
   
   - Backfilling of forebay walls done only after full period of curing.
   
   - Construction joints to be filled properly.
   
   - Weep holes to be constructed as per drawing.
   
   - Batter and side slopes are to be maintained meticulously for floor and side walls.
2) Pump House

- Excavation of pump house, forebay.
- Earthmat- embedments.
- R.C.C works of sump well. service bay including embedments for support to delivery pipes of pump.
- Pump foundations.
- Work upto gantry beam and erection of E.O.T. crane.
- Installation & erection of pumps, manifold valves e.g. reflux valve, B.F valve, Kinetic Air valve. etc.
- Forebay concreting.
- Forebay concreting.
- Head regulator work e.g Service gates, Trash Rack etc.
- Manifold- Fabrication, concreting.
- Antisurge works.
- Superstructure of pump house building.
3) **Rising main**
- Procurement of M.S pipes.
- Excavation for pipe trench/ and sand bedding.
- Wrapper coating or External Gunitting- fixing of wire, mesh, sand blasting, gunitting & curing.
- Internal Epoxy.
- Laying pipes & bends in position & welding.
- Ultrasonic testing for joints.
- Concreting works for anchor blocks, thrust blocks.
- Antisurge arrangements.
- Hydraulic testing of pipe line.
- Backfilling trenches.

4) **Mechanical Works**
- Earth mat for pumping machinery.
- Erection of Gantry crane.
- Erection of pumps.
- Erection of reflux valve, BF valve, KA. valve & manifold.
- Erection of control panels, feeders panel, installation of cables from feeder panel to pumps, motors etc.
- Trial of pumps.
5) Electrical Works

- Layout of switch yard, control room.
- Embedment in foundation of various equipments in switchyard.
- Civil works like concreting, construction of building for panels, batteries.
- Erection of components like transformers, L.A. foundation etc.
- H.T. line, erection.
- Testing of all equipments, H.T. line and obtaining license from Electrical Inspector.
- Supply to feeder panel and testing of pumps.

6) Commissioning

- After testing of all equipments commissioning of scheme is done.
- Electricity supply is taken to switch yard.
- Transformer is charged
- Electricity supply from switch yard to HT panel.
- Dry test run of pumps.
- Load test of pump.
- During commission of all equipments, valves, Rising main, antisurge system, gets tested. Finally scheme is commissioned.
Operation and Maintenance of LIS

- Operation and Maintenance of civil components
- Operation and Maintenance of Mechanical components
- Operation and Maintenance of Electrical components
- Role of civil wing: co-ordination of all above activities
Preparation of operation and Maintenance Plan

Activities of Maintenance

Civil       - Intake structure, Pump House, Manifold, Anti-surge, Rising Main & Delivery Chamber

Mechanical - Pump, Motor, Valves, Control Panel, Surge System, Allied Components

Electrical  - Transmission Line, Power Transformer, Circuit Breaker, Current & Potential Transformer, Isolator, Lightning Arrester, Control Panel
Procedure for Operation and Maintenance

- Identification of Operation activities, Maintenance activities & Estimation
- Preparation of Procurement schedule
- Funds Availability –
  - Irrigation
  - Non Irrigation
  - Recovery from beneficiaries against electricity bills (19%)
  - Government share (81%)
- Tendering process
- Execution of work
- Maintenance of required stock of inventory
### Activities of Operation

#### I. Operation

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Staff Required for Regular O.M.R. of Pump house and switchyard (Excluding for Idle period)</th>
<th>Staff required for single shift</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Up to 8</td>
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<tr>
<td>1</td>
<td>Pump Operators</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Electrician (Electrical Systems Operator) + Electrician for switch yard</td>
<td>1+1</td>
</tr>
<tr>
<td>3</td>
<td>Wireman for switch yard/ transmission line</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Fitter (For Repairing etc.) + for switch yard</td>
<td>1+1</td>
</tr>
<tr>
<td>5</td>
<td>Helper/Technical helper for switch yard</td>
<td>1+1</td>
</tr>
<tr>
<td>6</td>
<td>Sweeper (only for general shift)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>
II. Security

1) Single point entry for pump house premises under Vigilance of C.C. cameras displayed at security cabin.

2) Well armed security guard deployed at pump house premises for three shifts.

III. Check List

Before Starting Pumps

1) Water level & Discharge at pump house
2) Prestart checkup of electrical equipments
3) Supply from MSEDCL at Switchyard and switchyard to control room
4) Checkup of control panel & Protection relay
5) Prestart checks of motor, pumps & control valves
6) Checking of manifold / anti surge device/ Rising main /Kinetic air valve etc. up to delivery chamber
During Rotation

1) Daily observation of water level & discharge
2) Running of no. of pumps as per water required from civil wing
3) Cooling water system for pumps / motor assembly
4) Monitoring of voltage, current, power factor, bearing temperature of motor & pumps
5) Daily Discharge monitoring with mechanical wing
Intake Structure

- Periodical Repairs
  - Cleaning
  - Desiliting
  - Painting

- Special Repairs
  - Structural Repair work
Pump House Building

**Periodical Repairs**

- Cleaning
- Internal & External colouring & painting
- Repair works to water Supply, Sanitary unit
- Electrical Fittings & Fixtures

**Special Repairs**

- Repairs to roof / flooring / plaster / concrete work
Mhaisal L.I.S Stage 4

Before Maintenance

After Maintenance
Before Maintenance

After Maintenance
Pump House Premises and Manifold Area

- **Periodical Repairs**
  - Periodical Colouring & Painting to building, delivery pipes, manifold area
  - Removal of Grass/ weeds
  - Maintenance of garden

- **Special Repairs**
  - Structural Repair work – Compound Wall, internal Roads
  - Landscaping
Anti surge device

- Periodical Repairs
  - Routine maintenance to keep smooth operation of valves.
  - Colouring / painting

- Special Repairs
  - Structural repair work
  - Valve/pipe replacement if required
Rising main

- Periodical Repairs
  - Internal epoxy painting & external guniting
  - Joints of pipe & manhole
  - Maintenance of Air Valve & Valve pipe

- Special Repairs
  - Rising Main pipe joint repair work
  - Internal Anti corrosive painting of M. S. pipe and external guniting
  - Kinetic air valve replacement
  - Vertical M.S. pipe replacement
Delivery Chamber

Periodical Repairs
- Colouring & Painting

Special Repairs
- Structural repair work
Pump

- **Periodical Maintenance**
  - Cooling Valve Replacement
  - Bearing Housing Oil Top up
  - Gland packing filling
  - Pump Motor alignment
  - Hand rotation of pump

- **Special Repairs**
  - Full Overhauling (Bellmouth, bowl assembly, Impeller) repair/ replacement
  - Gland Sleeve replacement
  - Bearing Replacement
  - Shaft replacement
Motor

- **Periodical Maintenance**
  - Cleaning
  - Insulation Testing
  - Cable tightening
  - Bearing greasing

- **Special Repairs**
  - Bearing Replacement
  - Motor Rewinding
Valves (BFV/NRV/KAV)

- **Periodical Maintenance**
  - Testing of valve
  - Top up of power pack Oil
  - Flange gasket replacement
  - Hydraulic cylinder Hose pipe replacement
  - Application of grease to gear box assembly
  - Kinetic Air valve replacement

- **Special Repairs**
  - Replacement of hydraulic cylinder Tube
  - Limit Switch replacement of actuator
  - Cylinder pin replacement

- **Upgradation**
  - Single door NRV to multi door NRV replacement
Control Panel

- **Periodical Maintenance**
  - Cleaning
  - Insulation Testing
  - Tightening
  - On-Off dummy testing

- **Special Repairs**
  - Damaged parts replacement (Connectors, fuses, relays)

- **Upgradation**
  - Vacuum contactor is replaced by Vacuum Circuit breaker (Retro fitting)
Surge System

**Periodical Maintenance**
- System Checking
- Valve operation

**Special Repairs**
- Valve replacement
- Float replacement
- Painting
Allied components Rubber expansion joint (REJ), Delivery piping, Manifold, Rising Main

- **Periodical Repairs**
  - Tightening of flange bolts, Man hole gasket replacement, KAV ball replacement

- **Special Repairs**
  - Anti corrosive coating
  - Patchwork of Rising Main

- **Upgradation**
  - Metallic Expansion Joint
Electrical Wing
Transmission Line

**Periodical Repairs**
- Replacement of faulty insulators

**Special Repairs**
- Restrstring of Line

**Upgradation.**
- Replacement of Porcelain insulators by Polymer Insulator.
**Power Transformer**

**Periodical Repairs**
- Transformer Oil Top Up.
- Tightening of Palm connectors
- Insulation testing

**Special Repairs**
- Total Oil Replace
- Major repairs of transformer

**Upgradation**
- Conversion of 'OFF' Load to ON load tap changer system.
- Replacement of conventional Earthing to maintenance free Chemical Earthing
Circuit Breaker

**Periodical Repairs**
- Topping of Sf 6 Gas.
- Replacement/ Tightening of connectors.

**Special Repairs**
- Replacement Connecting rod.
- Overhauling of operating Mechanism

**Upgradation.**
- Replacement of Vacuum Interrupter.
Current & Potential Transformer

- **Periodical Repairs**
  - Top up of Oil.
  - Replacement/ Tightening of connectors

- **Special Repairs**
  - Replacement of equipment

- **Upgradation**
  - Replacement with Dead tank to Live tank.
Isolator

**Periodical Repairs**
- Replacement of Palm connectors.
- Cleaning of connections

**Special Repairs**
- Alignment of Mechanism
Lightning Arrester

**Periodical Repairs**
- Replacement / Tightening of Palm connectors.

**Special Repairs**
- Replacement of equipment

**Upgradation**
- Replacement of conventional Earthing to maintenance free Chemical Earthing.
Control Panels

- **Periodical Repairs**
  - Replacement of connectors, fuses etc.

- **Special Repairs**
  - Replacement of Relay, Contactors.

- **Upgradation**
  - Replacement electro mechanical relay with New Microprocessor based digital relay.
Thank you