From
Advisor
Lift Irrigation Schemes,
Irrigation & CAD Dept,
Govt. of Telangana,
Jalasoudha, Errummanzil,
Hyderabad.

To
All the CE’S,
I&CAD Department,
Govt. of Telangana

Lr.No. ADV/LIS/F. O&M/Do’s & Don’t Do’s/D.No. 3 /2020    Dt: 2-1-2020

Sir,

Sub: Lift Irrigation schemes – O&M - Do’s and Don’t Do’s at pumping stations (in case of Synchronous motors with FCMA or SFC start systems only) - Reg.

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As desired in the meeting held on 21.12.19 at Institute of Engineer (Vishweshwarayya Bhavan) Khairatabad, on discussion of O&M policies of pumping stations of present day LIS following are herewith attached for favour of information and necessary action at your end.

1) O&M guide lines.
2) Do’s and Don’t Do’s in pumping stations

Hence all the Chief Engineers are requested to instruct the concerned staff (up to AEE level) to follow these guidelines of Do’s and Don’t Do’s activities in their respective pumping stations.

Yours faithfully,

[Signature]
Advisor,
Lift Irrigation Schemes,
I&CAD Department,
Govt. of Telangana

Encl: as above

Copy submitted to Engineer-in-Chief(I), 2nd floor, Jalasoudha, errammanzil, Hyderabad for favour of information.
Copy submitted to Engineer-in-Chief (A), 1st floor, Jalasoudha, errammanzil, Hyderabad for favour of information.
Copy submitted to Engineer-in-Chief /Projects, LMD colony, Karimnagar for favour of information.

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1) The Chief Engineer/Projects, I&CAD Department, Khammam.
2) The Chief Engineer, I &CAD Department, Mahabubnagar.
3) The Chief Engineer, I &CAD Department, Nalgonda.
4) The Chief Engineer, Kaleshwaram, Hyderabad.
5) The Chief Engineer, Kaleshwaram, Karimnagar.
6) The Chief Engineer, JCR DG LIS Warangal.
7) The Chief Engineer, I &CAD Adilabad.
8) Commissioner, Godavari Basin, Jalasoudha, Hyderabad.
9) The Chief Engineer, SRSP, Jalasoudha, Hyderabad
10) The Chief Engineer, PRLIS, 5th floor, Jalasoudha, Hyd.
Dos and Don’t Dos of Lift Irrigation Schemes (In case of Synchronous motors with FCMA or SFC start systems only)

A) Dos

1) Before starting the pump-motor set, check for
   a) Incoming breaker D.C. Supply in ON
   b) Check for operation of breaker (keeping the isolator open in case of 132, 220KV or 400KV breaker)
   c) In case of draw out type 11KV breakers, draw the breaker into test position and check the operation of broken, if you are starting the motor after long shut down.
   d) Megger the motor by Isolating earth and P.Ts if you are starting the motor after long time.
   e) Check for grid voltage is it normal or if not, if high/low, adjust the transformer taps to get it to normal voltage level.
   f) Ensure excitation is perfect. Check Field circuit breaker operations.
      i. With main breaker in close position open the field breaker, it should not open.
      ii. With main breaker in open condition close/open the field breaker it shall open/close.
      iii. Closing operations of field breaker are with or without main breaker in open/close position.

2) D.C. supplies of all control panels, excitation A.C. supply is normal or not, is to be checked.

3) Check Discharge valves/ operations (only H.O.P.D in case of Francis turbine pumps, H.O.P.D and E.O.P.D operations in case of volute pumps or V.T. Pumps). Similarly check Guide vane operations (Guide Vanes provided) whenever Guide Vanes are checking, HOPD should be in closed condition and vice versa.

4) Switch on excitation system and confirm it is O.K. Check up, functional check of starting system.

5) Keep the E.O.P.D valve opening upto 85% of full opening, before starting the pump.

6) Start cooling water pumps and check for flow normality.

7) Start the motor from local PLC panel/ main control room panel/MMI system, as per system of starting, available and observe.
   a) Motor current during starting shall not be more than 2.5 times of rated current in case of FCMA starting system. 10 to 20% of rated current in case of SFC starting system.
b) In case of FCMA starting system, excitation is to be switched on (in case of manual operation by manually switching on and will get switched on automatically in case of auto start operation) when speed reaches 90% of rated speed.

c) In case of SFC system starting, excitation system is to be switched on before starting the pump.

8) Observe the starting time during starting, from starting up to rated speed and record it and check whether it is normal/more/less.

9) After reaching full speed observe, Voltage, current, Input power in case of FCMA start system and in case of SFC System with H.V. breakers, synchronise the motor with power grid and observe these parameters.

10) Check for MVAR if it is more, adjust excitation (Increase excitation if it is on leading side, i.e towards 1' O 'clock side), and if it is less decrease the excitation if it is lagging side i.e. towards 11' O 'clock side (In case of Analogue meters and (+) 0.9/(−) 0.9 in case of digital meters. While adjusting PF, observe MVAR, it shall be almost zero. Never reduce the excitation to below 95% of rated excitation current with almost unity power factor.

11) After getting P.F almost to unity, i.e 12 'o 'clock position in case of analogue motors, 0.95 to 0.98 in case if digital meters leave the system in that position.

12) After confirming everything is normal open the H.O.P.D fully and as the E.O.P.D is already in open condition, the water starts flowing. Open GV incase of provisiof GV. (HOPD shall be kept open position in case of GV)

13) Record following parameters every one hour
   i). Voltage
   ii). Current
   iii). Pump-motor input power (KW or MW) and KVAR or MVAR
   iv). P.F
   v). Excitation Voltage
   vi). Excitation Current
   vii). Frequency

B) Don’t Dos

1) Never meddle with breaker or Isolators when Pump-motor is running.

2) Never switch off D.C or A.C supplies to panels in particular excitation system, pump-motor supply breaker and protection panels.

3) While adjusting the P.F (Power Factor) in case of low/high P.F, take precautions and adjust properly. Never reduce the excitation current, below 90% of rated excitation current for correcting P.F.
4) Never try to control the discharge, more than ± 10% of rated discharge, by adjusting guide vanes in case of Francis turbine pumps and by H.O. P.D in case of volute pumps. Don’t run the pump-motor continuously with adjusted discharge for long periods in case of volute pumps.

5) Never try to control or adjust discharge of pump by E.O.P.D. (EOPD is offline valve)

6) Avoid operation of on load tap changer (OLTC) of transformer for correcting reactive power (KVAR or MVAR) unless otherwise, reactive power crosses the adjustment limits of excitation (current).

7) Never leave the control room unattended when pump/pumps are running.

8) Never attempt to check 6.6KV/11KV (H.T) system, without switching off incomer drawing out and to getting it to test position and glosses and standing on ground, always it is better to stand on rubber mat with 3mm thickness or coal conveyer belt of 10 to 15mm thickness to be laid in front of panels.

9) Never touch the bus bars of 11KV/6.6KV system without earthing.

10) Never run in the pump-house, unless it is emergency for escaping from pump house.

11) Never check/use phase secure meters, Multimeters etc., for live HT bus bars/panels, which are to be used for LT panels or after PTs on HT panels.

12) Never switch off battery charger/AC supply as it may drain the battery bank unless scheduled maintenance of batteries is planned.

Advisor
Lift Irrigation Scheme
Govt. of Telangana
02/01/2020
OPERATION AND MAINTENANCE OF MAJOR LIFT IRRIGATION SCHEMES

Lift Irrigation Schemes can be grouped into

i) Small Lift Irrigation Schemes
ii). Medium Lift Irrigation Schemes
iii). Major Lift Irrigation Schemes

A) MAINTENANCE:

i) Main Components of Major Lift Schemes

- Pump and Pump Controller
- Motor and Excitation System
- Discharge Valve
- Power Transformers
- Station Transformers
- Unit auxiliary transformers
- SFC transformers
- Substation Equipment
- Power Transmission Lines
- H.T and L.T Switchgear Panels
- D.C. Supply.
- UPS supply
- Pump and Motor’s A.C auxiliaries (OPU system, Compressor system, Cooing water system).
- Pumps starting equipment (Normally SFC or FCMA).
- Capacitor units for Power factor improvement.
- Control and Instrumentation Cables.
- Brake & Jack System.
• D.G Set for Emergency Supply.
• Energy meters.

Associated equipment of Major Lift Irrigation Schemes
• E.O.T Crane/ Mobile Cranes.
• Other miscellaneous items like Air Conditioning equipment of control room, ventilation, fire fighting system pump house etc.
• Intake Gates (Draft Tube Gates).
• Pressure Mains (Delivery Lines).
• Civil Structures like intake canal/ Tunnels, intake Gates, Cistern, canals etc.

B) OPERATION OF PUMPING STATIONS:
  a) General
    i) To run the pumps, as per requirement of ayacut and drinking water needs in the area.
    ii) Maintenance of records for pumps running hours, record of break downs of major components and details of repair works carried out in a month/year.
    iii) Preparation and maintenance of records for discharge of pumps, input power and Energy consumption of pumps on daily basis
    iv) Preparation and maintenance of records of total station discharge, input power and energy and other data, day wise, month wise and year wise.
    v) Programming of maintenance/ repairing works and recording of maintenance/ repair works of equipment done if any.

  b) Technical
    i) The operation engineer should have idea of plant layout i.e. location of various equipment in the pumping station.
    ii) The important knowledge required for operation engineer is to have good idea of location and operation of dewatering pumps and lighting system, to act quickly in case of failure of power supply during pumps running or pumps in standstill condition.
iii) Functional check of Diesel Generator (D.G) set is to be done once in a day during morning hours and maintenance record of D. G set performance and Diesel stock record

iv) Observation of battery system voltage and checking of specific gravity of batteries once in a week in case of lead acid batteries.

v) In case of Maintenance free’ batteries as per manuals of batter supplier.

vi) Checking of UPS system output voltage.

vii) Inspection of various areas for cleanliness and observation of abnormalities, water leakages in pump house, arranging replacement of fused lights and observation of pump motors and transformers if any and starter panel for sparking due to loose connections of power cables equipment of pump house

viii) Greasing and functional check of Crane once in a month

ix) Functional check of dewatering pumps, air compressors. OPU motors, cooling water motors when they are not running.

x) Functional check of emergency lighting system once in a day

xi) Observations of operation of auxiliaries during starting and stopping and record of any abnormalities for studying, the reasons for the same and rectification of the same if possible when pumps are not running.

xii) During Starting of pumps, observation of input parameters readings on Unit control panels / Mimic board or MMI system and action to be immediately if any deviations if possible. If not possible recording of same to attend during pumps to running periods.

xiii) Observation of alarms and annunciation system in case of faults, mechanical vibrations and during of starting/ stopping and recording of the same for study and rectification of the same during pumps not running periods.

xiv) Observation and recording of system voltage, current and input power of motors, discharge of pumps, during peak hours and off peak hours of power grid during pumps running/ standstill conditions.

xv) Switching ON/OFF of Capacitors units for proper maintenance of power factor in the plant to avoid penalty clause of power supply organization for low P.F in particular pumps not running periods

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**ii) Maintenance Activities**
If the pumping stations are properly designed by taking care of ratings in respect of pumps, motors, switchgear, starting equipment, cables, and all aspects of grid conditions and fault levels of pumping station and pumps running conditions and also site conditions, the scope for failure of any equipment will be minimum.

Normally in present day major pumping stations like AMRP LI schemes, there will not be any specific maintenance activities except routine type.

i) Carryout routine maintenance works of
   a) Pumps & Motors as per the manufacturer’s standards.
   b) Starting equipment
   c) H.T & L.T switchgear
   d) Power Transformers and auxiliary power transformers
   e) Sub station equipment
   f) Power supply lines,
   g) Control and Protection equipment and all other auxiliaries, as per recommendations of the manufacturers.

ii) Maintenance works of pumping station shall be carried out during shut down periods of pumps, particularly in summer, when pumping requirements for irrigation are not much.

iii) In case of pumping stations which are formulated for irrigation as well as drinking water requirements, it is always better to take shut down of pumps for maintenance one after other.

iv) Programming of maintenance / repair works if any in advance.

In general the maintenance works will be done yearly (during summer) and the works include

a) Pumps and Motors and associated equipment
   i) Checking bearing oil levels, checking of oil purity and filtering of oil if required.
   ii) Cleaning of cooling water strainers, Meggering and functional check of cooling water Pump and Motors. (Start/stop checks).
iii) Cleaning and bearing’s lubrication oil checks, oil sample tests and functional checks

vi) Functional check of excitation system and starting equipment.

v) Checking and tightening of power cables terminations if loose (Once in six months).

vi) Cleaning of motor slip rings.

vii) Testing of bus duct C.Ts, P.Ts and all bus duct components (once in a year).

viii) Meggering of stator and rotor before starting after long shutdowns if any.

ix) Greasing of E.O.T crane rails, Meggering of motors functional check of E.O.T. Crane, etc.

b) Power Transformers

Meggering of transformer, Conduct BDV test on transformer oil, filtering and filling of oil if required, OLTC operational check, cooling system Pumps/ Fans functional checks.

c) Switchyard Equipment

Meggering of all equipment of C.Ts, P.Ts and CVTs, Breaker and Isolators.

d) Functional check of Breakers, Isolators

e) Power Lines

Conducting pre monsoon inspection, tree cutting and meggering of power lines etc.

f) Measurement of earth resistance

g) Civil and Hydro mechanical

i) Cleaning of silt in intake canals trap pits, surge pool, lubrication and operational Check of all gates.

ii) Attending patch works of civil structures of pump house, surge pool, Cistern, office and residential buildings.

iii) Functional checking of water and power supply system of colony.

iv) Cleanliness of pump house area, colony areas etc.

v) White washing of pump house, office and colony buildings once in three years and cleaning of water and drainage system of office and residential buildings.