Tech Bytes

"Knowledge shared is knowledge multiplied"

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Vijaipur Unit

Up-gradation of DCS/ESD system of Line-II Ammonia & Urea Plants

by Ajeet Kumar, S.M. (Inst.)

Introduction:

DCS & ESD system of Line-II Ammonia & Urea Plant was supplied & commissioned in 1997 by M/s Yokogawa India Limited. Make/Model of DCS system was M/s Yokogawa Centum-XL and make of ESD system PLC was M/s HIMA. The field multiplexer system (MUX) of make STAHL was interfaced with DCS as a sub-system for monitoring of process variables of non-critical open loops and alarms. Centum-XL Yokogawa DCS system, HIMA PLC based ESD system and STAHL MUX systems are obsolete nowadays. No service and spare support were available for all the above mentioned system. So, it was very difficult to maintain the old system.

Action Taken & Challenges:

Up-gradation job of line-II Ammonia and Urea DCS & ESD was awarded to M/s Honeywell. The major challenge was to retrieve all the programming backup of Yokogawa DCS/ESD system and to implement it into Honeywell platform. Another challenge was to complete the installation and commissioning of DCS & ESD system within 20 days of line-II Annual shut down. During the Annual shut down period with planned shut-down jobs and so many other upgradation schemes such as upgradation of Bently Nevada make 3500 series Vibration Monitoring System of line-II, Dressor-Rand GE-Fanuc PLC upgradation of Synthesis & Refrigeration compressor, upgradation of GT-PAC Mark-VIe control system and upgradation of 31 CO2 compressor Anti-surge controller (CCC controller) with S3++ series, Instrumentation team decided to take these challenges with available limited manpower resources. The DCS/ESD system of Line-II Ammonia & Urea plants was upgraded to latest system of M/s Honeywell in August-September, 2021.

Job Planning:

Since upgradation of DCS/ESD system was retrofit type as old Yokogawa DCS/ESD system to be upgraded with Honeywell make DCS/ESD system. Considering the time-bound completion of this upgradation job within shut down period, planning of job was bifurcated in two parts: Pre-shut down or Pre-commissioning activity and shut down activity or final commissioning activity.

Pre-Commissioning/ Pre-shut down Activity:

1. During pre-commissioning activities all open & close loop signal wiring details were noted down. Programming of all open/close loops and trip interlock retrieved from Yokogawa system and implementation of the same in new Honeywell system was done. These interlock logic were verified by Instrumentation & Process team.
2. Identification of space inside Central Control Room (CCR) for Honeywell DCS/ESD system cabinet along with its marshalling cabinets. The major challenge was to shift all new Honeywell cabinets inside control room along with fixing of its base frame in running plant. In blast-proof Wall inside CCR DCS panel room, a cut-out in Control room was made by Civil and fixing of base frame done for installation of new cabinets. Installation of 70 no. new cabinets was done on its new base frame in running plant. The major challenge was to maintain the dust-proof arrangement during wall cut-out period and to maintain control room temperature during normal running plant with existing old DCS/ESD system.
3. Approximately 200 no. Multi-core cable (length 500 m for each cable) laying was done for open loop signal in field multiplexer system. Cable tray laying was also done for accommodating these cables.
4. Installation of field JB against old multiplexer system in field was done and all open loop signals shifted from field multiplexer system to new DCS system.
5. Prefab cable laying was done between new DCS/ESD system cabinet I/O modules to Marshalling cabinet.
6. UPS 110 VAC provided to PDB cabinet and power cable distributed to all DCS & ESD system and marshalling cabinet. System power 'ON' and healthiness of DCS & ESD system checked.

Final Commissioning Activity:

1. During Shut down, all the cables from old Yokogawa panels were identified and terminated in new Honeywell cabinet. Various multi-core signal cables and power cable laying was also done within shut down period.
2. The loop checking & simulation checking of all I/O related to DCS & ESD system was done. All trip interlock simulation checking and control valve stroke checking was done by Instrumentation and process team.
3. The field MUX system was removed and MUX input / output signals were implemented in new DCS system.
4. Implementation of 31/41 CO2 compressor & P2 A/B carbamate pump old relay based interlock and local indication & control to new DCS /ESD system. New DCS/ESD HMI installed in Compressor control room to monitor & control the process parameters.

5. Replacement of old YOKOGAWA Operator Works station and Engineering Works station with Honeywell system. Remote monitoring of new DCS system to Technical Service department through fibre optic cable provided.
6. All old Yokogawa DCS/ESD panels were removed from Cabinet room.
7. MODBUS communication established from Vibration Monitoring System rack and CCC controller to Honeywell DCS system.
8. The plant started smoothly and complete job was done in scheduled time.

Conclusion & Recommendations:

Great team spirit under dynamic leadership made this upgradation job feasible within the time schedule of planned shutdown. The DCS & ESD system upgradation has enhanced the reliability of plant along with better monitoring & control of process parameters.

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Vijaipur Unit

Up-gradation of Vibration monitoring system of Line-II Ammonia & Urea Plant

by Ajeet Kumar, S.M. (Inst.)

Introduction:

The Bently Nevada make 3300 series Vibration monitoring system along with DM2000 analysis system was installed since commissioning of line-II Ammonia & Urea plant in 1997. 3300 series VMS system was installed for critical rotating machine monitoring of Synthesis compressor, Refrigeration Compressor, GT-PAC, N2 Blower, CO2 Blower in Ammonia-II plant and CO2 compressors & Carbamate pump P2-A/B of 31 & 41 streams of Urea-II plant. 3300 series VMS system was declared obsolete by OEM and no spare/ service support was available.

Action Taken:

The Vibration monitoring system of Line-II Ammonia & Urea plants has been upgraded to latest 3500 series system of M/s Bently Nevada in last shut down August-September, 2021. DM-2000 software for analysis of Vibration monitoring system was also upgraded with latest System-1 server.

Major Jobs done:

1. M/s Bently Nevada make 3300 series VMS system was upgraded to 3500 series of 31/41 CO2 Compressor & 31/41 P2A/B Carbamate pumps of Urea-II plant.
2. Up-gradation of 3500 series VMS system of Ammonia-II plant Synthesis Compressor, Refrigeration Compressor, GT-PAC, N2 Blower and CO2 Blower done.
3. The 3300 series VMS racks were removed and 3500 racks were mounted.
4. The rack configuration was done by retrieving 3300 system data.
5. Simulation checking of all field probes done with TK-3 machine.
6. Hardwire connection done for Alarm & Danger setting of VMS system to Honeywell DCS/ESD system.
7. System-1 server installed and commissioned in central control room for all upgraded VMS-3500 systems. Communication established from each VMS rack to System-1 server through OFC cable.
8. One client of system-1 server each for Ammonia-II and Urea-II plant installed.
9. One remote-2X server also installed for diagnosis purpose in CCR.
10. MODBUS communication established from each VMS rack to new HONEYWELL DCS system.

Conclusion & Recommendations:

The VMS system upgradation along with System-1 server commissioning job was done well within the time schedule of plant startup. The same has enhanced the reliability of new VMS system along with better diagnosis of critical machine monitoring through System-1 server.

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Nangal Unit

Problem of MPA 2CN VFD in Urea Plant

by Abhishek Gupta, S.M. (Elect.)

Introduction:

There are 4 carbamate pumps installed in Urea plant. Out of these four pumps, three pumps (MPA-2A /2B /2R) are having Direct on line (DOL) starting which were installed since Commissioning of Urea plant (1974) and fourth pump MPA-2C/N (350 KW, 3.3 KV New Carbamate Pump Motor) is fed through Variable Frequency Drive (VFD) which was installed during Urea Revamp (2001). In order to meet process requirement, three pumps are always kept in line and one is kept as standby.

Observations:

On 14.11.2021, it was observed that MPA-2CN motor tripped on overcurrent. On further investigation, it was found that 'B' phase limb of the output transformer (690V/3300 V, Vector group Yd11) was faulty and needed replacement. There was no spare output transformer available. Moreover, as the Transformer is epoxy resin molded type, it cannot be repaired in our electrical workshop due to lack of special insulating material and casting requirements. The other three motors were running and the said VFD pump was out of order. Unit was left with no standby pump. Carbamate pumps are critical and stoppage of any running pump and non-availability of spare pump directly affects the operation as well as load of Urea plant.

Diagnosis & Action Taken:

One spare Input Transformer of rating 3300/690V with star delta connection (Dy11) was available. But issue was to use this available Input Transformer in place of Out Put Transformer, having different Vector Group (Vector group Yd11, 600/3300Volt) to make VFD operational without effecting any of its operating parameters and protection systems. After lot of technical discussion among our staff, OEM and Sister units, finally it was decided to use spare input transformer as output transformer without changing its vector group.

To protect the motor from earth fault, after the output transformer connection, an additional sensitive earth fault relay with CBCT was provided on output Cable (3.3KV) of the Output transformer side. All the required materials were arranged in house and system was handed over after incorporating the required modifications in the system.

Conclusion/Recommendations:

Motor trial run taken in the decoupled position and found O.k. Motor coupled and taken in line on 17.11.2021. Motor took normal start. All other parameters were checked and found normal.

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Panipat Unit

Upgradation of MOC of control valve Tag No. 02-PV-189A/B (Natural Gas header pressure control) at Ammonia plant

by Anjul Kumar, D.M. (Inst.) & Sushil Goyal, AM (Inst.)

Introduction

In Ammonia plant at NFL Panipat, control valves Tag No. 02-PV-189A (Size: 2") and 02-PV-189B (Size: 3") are installed in NG fuel gas header for controlling fuel gas pressure. These control valves are installed in parallel and work based on Split range philosophy i.e. **02-PV-189A** opens 0 to 100% corresponding to 0 to 50% output signal from the controller 02-PIC-189 and **02-PV-189B** opens 0 to 100% corresponding to 50 to 100% output signal from the same controller (02-PIC-189). These valves are globe type valves of Fisher make. Valves are designed with anti-noise trim. As per original design MOC for both valves was: Cage: 316SST ENC, Plug: 316SST (stellited), Seat: Alloy 6 (stellited), Stem: 316SST, Body: WCC steel.

Observation:

On 14th Sept' 2016, it was observed that Natural gas started leaking from the valve body of control valve 02-PV-189A. Upon inspection it was found that valve body was punctured. Control valve was isolated immediately and control was shifted to 02-PV-189B. After getting clearance, Valve 02-PV-189A was dropped by Instrumentation team and sent to Workshop for overhauling. During overhauling, extensive damage in valve body & trim was observed. Instrumentation (workshop) team repaired the valve body and replaced the trim with spares available. Valve was hydro-tested and fixed back in line after satisfactory performance.

Diagnosis and Actions Taken:

The extensive damage observed raised many questions about the design of control valves and it's failure. For root cause analysis issue was reported to OEM M/s Emerson Process Management Chennai Pvt. Ltd. along with photographs of damaged trim and valve body. As per preliminary discussion with M/s Emerson team, damage in trim seems to be caused by process condition/fine dust particles presence in natural gas supply.

Presence of dust particles was confirmed after checking. Point shared with M/s Emerson design team for further investigation. It was suggested that Anti-noise cage is a drilled hole cage. Plugging of holes due to presence of particles/dust might cause damage and also limit the flow.

After detailed investigation, M/s Emerson design team reverted back with solution to harden the material of construction of Cage and valve body. They suggested to upgrade valve body/bonnet MOC to CF8M and trim having cage with MOC 17-4PH, 316SS Stellited plug and seat ring. As a special case, OEM supplied complete upgraded trim and valve body/bonnet for 02-PV-189A free of cost.

During ATA-2018, control valve 02-PV-189A was again dropped to fix the upgraded trim and body/bonnet which was supplied by OEM. Trim for 02-PV-189B was also upgraded in same line by procuring spares with upgraded MOC. Since then, both the valves are working fine. No damage in trim and valve body has been observed till date.

Conclusion and Recommendation:

1. From this case, it was clear that NG supply containing dust particles may damage 316SST (stellated) material, therefore harder material (MOC: 17-4PH) may be preferred for NG service valves.
2. These valves are being dropped in every ATA for inspection. Though we have not seen any damage in valve body and trim since this MOC up gradation. Periodic overhauling and trim inspection of these valves as a preventive action is recommended.

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Bathinda Unit

Rectification of High vibration Problem in Hot-well Pump P 404 A of Process Air Compressor

by Vicky Singla, Mgr. (Mech.)& Pushap Kumar, CM (Mech.)

Introduction:

Hot-well Pump P404 of Process Air Compressor is multi-stage vertical centrifugal pump to handle turbine condensate in Ammonia Plant. There are two pumps one is running continuously and another one is stand-by pump.

Observations:

High vibration of 8mm/sec & 60 microns was reported at motor of HWP P404 A in the month of November 2021. As the pump is vertical type, so any problem in pump or motor is normally reflected as high vibration of the motor only. Pump P-404A was taken to attend the problem of high vibration.

Diagnosis & Action taken:

Following actions were taken during maintenance of pump motor assembly.

1. Solo run of the motor was carried out. Motor vibration of 7mm/sec was observed during the solo run. So bearings of motor were replaced. After coupling job, vibration was still on higher side.
2. Pump again taken for maintenance. This time, run-out of pump was checked at coupling of top shaft and found to be 0.5mm.
3. Top shaft dismantled and checked for run-out in shaft. Run-out in shaft found within range of 0.05mm.
4. Flexible coupling between electric motor and top shaft was checked and found ok.
5. Then doubt come on rigid coupling which couples top and pump shaft. The Rigid coupling has three components- two coupling hubs and one sandwich spacer. All the three components checked for flatness with a doubt that it may result in run-out reading of top shaft. Reading of face of components of rigid coupling was checked and found to be max 0.04mm. In order to rule out problem of run-out due to flatness, all the three components were lapped.
6. After performing all the above activities, the pump shaft run out was taken again and found to be same i.e, 0.5 mm.
7. Finally, as no problem was observed in the pump shaft assembly, it was decided to check mechanical seal assembly on the pump shaft. Mechanical seal sleeve gets drive force from the pump shaft through four grub screws. While loosening these grub screws, run-out of the top shaft came within 0.08mm. Then the mechanical seal sleeve was tightened on the pump shaft by maintaining the run of top shaft within 0.05 mm.

8. Pump assembled and checked for vibration and found vibration at a level of about 1.8mm/sec.

Conclusions & Recommendations:

From the above it can be understood that mechanical seal sleeve uneven tightening may also lead to the run-out of top shaft of a vertical pump assembly resulting in high vibrations and this needs to be included in the maintenance check list.

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Corporate Office

NFL's New Projects

by Jagmohan Bundela, Mgr. (Projects.)

1. Crop Protection Chemicals

NFL is a PAN India company and expanding its business portfolio in various horizons in the field of Fertilizers & beyond. NFL is also committed to farmers of the country and therefore, is in continuous process to provide all Agri-inputs to farmers under one roof. For this, NFL is setting up plants for different Agri-inputs. In this direction, NFL has set up Bentonite Sulphur plant at Panipat, Bio-Fertilizer plant at Vijaipur, Seed processing plants at Bathinda, Punjab & Panipat, Haryana and one is being set up at Indore, Madhya Pradesh.

In continuation to this, NFL is also setting up its own Agrochemicals production facilities (formulation) at NFL, Bathinda. Agrochemical plant being set up at Bathinda unit shall not only help in providing agrochemicals to farmers under the same roof but also increase the income of the company.

Initially, it has been decided to produce 23 agrochemical formulations which are of following type of formulations:

1. Wettable powder/Soluble Powder
2. Soluble Granules/Wettable Granules/Wettable Dispersing Granules
3. Coated – Granules/Granules
4. Suspension-Concentrate
5. Emulsifying Concentrate/Soluble Liquid/Liquid

The Plant comprises Five Trains/Streams having separate Train for each type of formulations mentioned above. Total proposed installed capacity of the plant is 3306 MT/KL per annum. Capital cost of the plant shall be approx. Rs 12.5 crore.

The five Trains/Streams being installed are also capable of producing molecules other than 23 molecules of similar formulation type mentioned above. The plant is being set up inside NFL, Bathinda premises (at dismantled Sulphur recovery plant) having total area of 7500 square meter.

Registrations of all molecules are being done with Central Insecticides Board, Faridabad.

Plant is expected to be commissioned by end of FY 2021-22 with production of 2 formulations to start with.

2. Nano Urea (Liquid) Fertilizer

IFFCO has developed and patented technology for production of Nano Urea (Liquid) fertilizer. The Nano Urea (Liquid) fertilizer developed by IFFCO is FCO approved. One bottle of 500 ml of Nano Urea (Liquid) is equivalent to one 45 kg Urea Bag. One bottle of Nano Urea is 10% cheaper than the bag of urea without involving any subsidy. As per IFFCO, average 8% increase in crop recorded on different crops, leading to approx. Rs 2000-3000 / acre incremental benefit to the farmers.

Keeping in view above benefits and forecasting the use of Nano Urea (Liquid) as fertilizer in India, NFL's Board of Directors has approved & accordingly it has been decided to set up our own Nano Urea (Liquid) plant at Nangal Unit based on IFFCO's technology. In this connection, NFL has signed Confidentiality Agreement, Memorandum of Understanding (MoU) and License Agreement with IFFCO for providing technical information for setting up of production plant of Nano Urea. For sharing Basic Engineering Package, a Basic Engineering Agreement (BEA) has been signed between NFL and IFFCO on 19.01.2022.

The proposed plant shall have Capacity of production of 1.5 Lakh bottles (500 ml) of Nano Urea (Liquid) per day. The plant will be equipped with its own Bottle manufacturing unit including bottling (Filling, Packaging, Capping, Sealing etc.) unit. Plant is expected to be commissioned by September 2023.

To move ahead, the processes for preparing TEFR and EIA/RA study/Environment Clearance have been started.

3. Ramagundam Fertilizers and Chemicals Limited (RFCL)

NFL, EIL and FCIL entered into agreement on 14.01.2015 for setting up a Joint Venture Company with equity participation by promotors as NFL – 26%, EIL – 26% and FCIL – 11% (against Land and usable assets). Subsequently, Ramagundam & Fertilizers Limited (RFCL) was incorporated as Joint Venture Company on 17.02.2015.

The balance untied Equity of 37% was also tied up by inducting Govt. of Telangana (GoT), M/s GAIL and HTAS Consortium for 11%, 14.3% and 11.7% equity respectively.

Zero date of the project was 25th Sept 2015 with the scheduled completion of the project in Sept 2018. M/s EIL was EPCM Contractor for the project.

Total Installed capacity of plant is 12.7 LMT Urea per annum. The revised cost of the Project is Rs 6338 crore.

Manpower Management Consultancy (MMC) agreement was signed between NFL and RFCL in Nov 2017 to provide / recruit manpower for RFCL by NFL.

Further, in line with Joint Venture Agreement, marketing of RFCL products is also being done by NFL. Marketing Agreement between NFL and RFCL was signed on 29.08.2018. NFL has set up its marketing teams and network in southern states also

for marketing of RFCL urea and has also opened its 4th Zonal office in Hyderabad in August 2018.

Urea production commenced on 22.03.2021. At present, plant is in the process of ramping up the capacity utilization (currently approx. 60 – 65%). Technical issues faced are being gradually resolved.

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