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Sugar Mills Ltd.

HAZARDS OF HYDROGEN SULFIDE (H2S) FOR ELECTRICAL AND ELECTRONIC INSTALLATIONS

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INTRODUCTION

Carbonization & rust is always dangerous for electrical and electronic installations. This undesirable deposition at electrical/electronic equipments and electric contacts mostly gives following problems

- Low and improper crossing of voltages
- Ionization of neighboring circuits
- Creates weakness in copper and brass metals

Rust deposition normally occurs on copper metals due to humidity in the air. This pace is accelerated in recently established ethanol plants which disperse and diffuse more sulferized gases in surrounding atmosphere. Fact is that people should accept this reality and lope for adequate counter measures for Hydrogen sulfide (H_2S).

INTRODUCTION

Like Bagasse for the Sugar Mills, biogas is a source of saving in Distilleries. Composition of biogas is Methane (50%~55%) + CO_2 (40%~45%), H_2S (1%~ 3.5%) and remaining moisture which varies as per ambient as well as digesters temperature. It is very difficult to generate H_2S free Biogas due to use of sulphuric Acid in fermentation process from 2500 to 3500 liters/day.

It diffuses into the air by following practices

- By open settling and cool down of spent wash
- Leakage of digester membrane in case of UEM plant
- Open operation of clarifier and degassing tank in case of Proserpol plant.
- Open emergency Vent
- Leakage in lines and Blowers
- Improper Biogas traps
- Less induction capacity of Biogas Burner
- Poor combustion in furnace resulting in vent of sulferized gases in smoke through chimney
- Open storage and drains of treated spent wash

STUDY RESULTS

By maintaining clean atmosphere and especially the surroundings, we can counter these situations. Biogas waste also can be treated by different processes to convert it into useful products such as agriculture water, bio compost and helping material of solid fuel

These all are achievable but require dedicated efforts ;

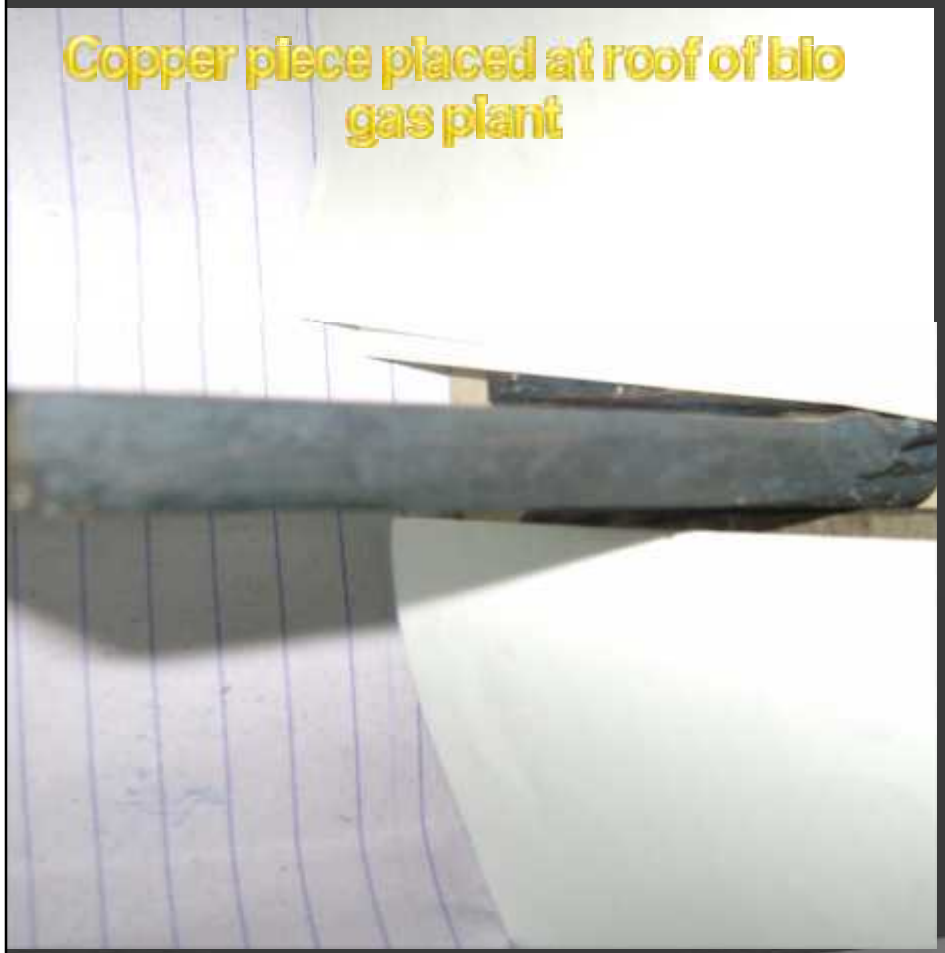
This paper is a study of the effect of that how Hydrogen Sulfide gas on metals, especially copper and silver. Copper is the cheapest good conductor and is widely used in electrical installation and electronic equipments. The study has been carried out in the environment of distillery and the adjacent mill which are at the approach of such gases diffusion

Following experiments were made at Matiari Sugar Mills and Matol (Pvt) ltd

- We placed one inch half coated bus bar pieces at the roof of cooling tower control room (in the way of un treated spent wash air , which traveled from south / west to North/East)
- One half Tin Coated and bare Copper piece placed at the roof of Bio gas control room in north direction of biogas digesters
- A third piece of the same material was placed at Jamshoro 40 K.M away from Site
- Fourth piece was placed at Power House of Sugar Mills 500 meters in direction of Eastern/North of treated spent wash

OBSERVATIONS

- The piece placed near the bio gas control room was found to be worst affected the portion of the copper but 25% area of tin coated was carbonized .



OBSERVATIONS

- Copper piece the portion of same bus bar placed at the roof of cooling tower control room in the way of untreated spent wash was also badly effected, Its tin coated portion was less effected

OBSERVATIONS

- Piece carried from the roof of M.S.M Power House.

OBSERVATIONS

- The piece kept at Jamshoro which is out of the reach of Hydrogen Sulfide gases. Above pictures and study of this paper proved that self generated sulfide gases are unpleasant. In high concentrations. They can even be life threatening and dangerous for all installation which comes in its exposure and especially at the direction of wind from Bio gas. Pictures show that copper is easily effected due to corrosive action. Experience also shows that medium and low Voltage equipments easily fail due to carrions within no time especially controlling and dry contacts created high level disturbances in control system when supplied un proper signals.

PROBLEMS AND CONSEQUENCES

Following table illustrates the equipments which quickly accept effects of carbonization. **The table also explains the nature of problems and consequences.**

S.NO	Control Equipments	Parts of Equipments which get easily defects	Nature of Problems	Remarks
01	Control Cards	Sliding Contact area	Flickering low voltages or missing After couple of days complete failure	a) In case of ignoring equipments could be failed b) disturbance of system
02	Electronic Control Relays or Signaling equipments	Ionization of Neighboring circuits or failure of some parts	Wrong communications and shut off the equipments	Wrong signaling is more dangerous than shut of because if you are getting control signals of some power electronics or any heavy equipments resulting a unpleasant situation can be occurred.
03	Magnetic Contractors	Silver tips of moving and fixed contacts	Improper crossing of voltages	Dangerous for equipments

PROBLEMS AND CONSEQUENCES

S.NO	Control Equipments	Parts of Equipments which get easily defects	Nature of Problems	Remarks
04	Circuit Breakers	Contacts	Take temperature and some times failure of phase	Carry minimum load to comparative its rated load and failure of is a serious hazard for electrical installation
05	Air Conditioners / Refrigerators / Dryers	Copper coils of Condensers and radiators	Copper pipes carbonized and finally damaged	Equipments failed to provide expected services
06	Boilers	Steam tubes and economizer tubes	Tubes leaked due to deposition of H_2S	H_2S condense at high temperature

(Data of above tables taken our survey reports of 2011 and 2012)

H2S GAS DAMAGES EQUIPMENTS AS PER THEIR APPLICATIONS

It is also observed that H2S gas effects or sulfur deposition damage equipments as per their applications

- Signal/reference equipments as milli Amperes or low D.C voltages got failed shortly
- 24 Volt and 48 Volt equipments and their dry contacts also effected but provide more service then serial No 1
- Low A.C Voltage equipments also are equal to serial#2
- At medium Voltages and high Voltages equipments provide longer service then serial # 1,2 and 3 but age of equipments reduced and provide less service then normal working conditions
- Air Conditioning and Refrigeration Equipments. Copper pipes of condensers and Evaporators of above items carbonized resulting became weak and finally got pin holes or leaks from joints. This occurrence of gas leakage leads to damage the compressor of equipments
- Tubes of Economizers and Boilers
- H2S gas deposition on boiler tubes in the area of furnace and economizer damages got pin holes and leaks from joints, damages of tube mostly seemed in economizers because un-burnt gases passes through economizer, where temperature is low and sulfurized gas condense make layers of M.S tubes actually this layer or deposition is the responsible of leakages.

SAFETY PRECAUTIONS

AVOID OR MINIMIZE GENERATION OF H_2S GAS

- Generation of sulfur starts from the field of cane due to the consumption of some fertilizers as Zink Sulfate and SOP. These fertilizers are necessary for the nutrition of plant. However the small quantity of sulfur digested by the plant which is un diffusible but beome the reason of sulfer availability
- Some Sugar Mills use Sulffitation process, which is another reason of sulfur availability in molasses
- Mostly distilleries are using Sulphuric Acid in their process which became the reason of sulfur in spent wash

CONTROL ON THE DIFFUSION OF H_2S GAS

- Diffusion of H_2S is already mentioned in this paper

RECOMENDATIONS

- Spent Wash store in closed tank and cool down by circulation process
- Damage and expired Membrane of Bio gas digesters to be replaced in case of UEM Plant
- Stop the open operation of clarifier and degassing tank in case of Prosepol plant
- Emergency Vent ultimately open at flare or in closed vessels
- Shutoff all leakages of blower rooms and bio gas lines
- Improved all improper traps
- To be installed proper biogas burner at Boiler
- Single passage Boilers are main reasons of these un burnt gases . If line treatment of biogas to be made then can be got rid off from these un burnt gases which is the main cause of economizer tubes losses
- Drains of treated spent wash must be closed , but try to prepared in agriculture water etc as reported in this paper earlier
- All control rooms should be complete dust free all passages of incoming air should be closed

RECOMENDATIONS

- All Windows and doors equipped with blower curtains
- No window ACs to be installed in control rooms
- Temperature of control rooms to be maintained at 22 Centigrade
- All panels should be closed all cable entries must through proper glands filters must be provided at air in coming passages, and filters should be cleaned on regular basis or as per needs
- Bus Bars and other current caring installation should be tin coated
- At the time of procurement must be explained your atmosphere and insist on supplier that they must provide anti rust coated equipments
- Anti sulfur smaller bags as anti moisture bags should be placed in panels
- Rubber paint to be provided at the cooling coils of air conditioners and refrigerators
- Anti corrosion contact cleaner must be used at Ag contacts
- New distilleries to be designed in wind opposite direction of Sugar Mills and Bio gas also design in opposite direction of Distilleries and other installations

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THANK YOU