Final Year Project Showcase for Batch-2016

Department of Metallurgical Engineering		
1	**Project Idea**	Study the effect of leakage of copper-based tube under the influence of corrosive environment and proposed the preventive solution for the material failure and leakage.
2	**Process**	First of all the sample surface was visually inspected by naked eye and then using Stereo microscope (max magnification 50X). The chemical composition was checked by X-ray Fluorescence spectroscopy. The metallography of selected areas provided evidence of the presence of severe pitting corrosion at the localized regions. Scanning Electron Microscopy (SEM) and Electron Dispersive spectroscopy (EDS) confirms the presence of corrosion products i.e. CuO and Cu_2O formation at localized regions. Then after thorough literature review the preventive action has been recognized to use a suitable corrosion inhibitor along with cooling water to inhibit severe corrosion in copper tubing.
3	**Outcome**	The complete study on copper tube surface reveals the presence of pitting corrosion due to the formation of CuO and Cu_2O as corrosion by products. A corrosion inhibitor has been suggested.
4	**Evidences (Theoretical Basis)**	EDS analysis confirms the presence **of** CuO and Cu_2O formation at the surface of Cu tubes. Literature confirms the Oxide formation in Cu tubes can be inhibited using Hydrazine.
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what. You can select one or more from following dropdown and delete rest of them)	
a	**Cost reduction of existing Product**	The life enhancement of Cu tubing as a result of corrosion inhibition is expected to decrease the financial burden.
b	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of whole process** (e.g. What is issue is current process and what improvement you suggests)	The use of Hydrazine as suggested corrosion inhibitor can decrease the corrosion rate and thus increases the overall life of copper tubing and decreases the failure risk.
6	**Team Members (Names & Roll No.)**	Mr. Usama Bin Raees Mr. Dabeer Naqvi Ms. Romila Sarwar Mr. Subtain

7	**Supervisor Name**	Engr. Zubia Anwer (zubia@neduet.edu.pk)
8	**Pictures**	Given below

(a)

(b)

(c)

(d)

Figure 1 a,b,c,d shows the selected area of copper tubes for failure analysis

STEREO MICROGRAPHS

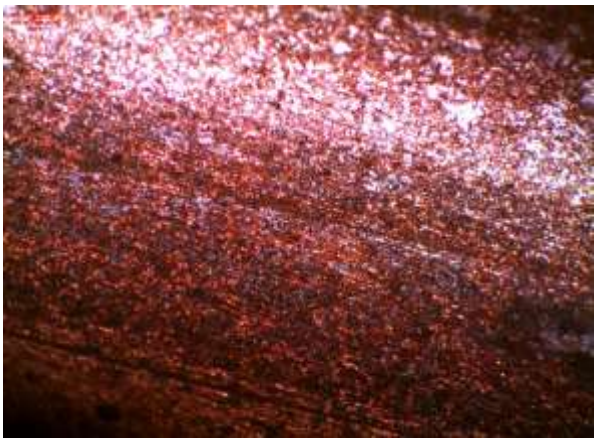


Figure 2. Red-Brown corrosion films very much similar like the reference micrograph. It is also the start of Pitting Corrosion

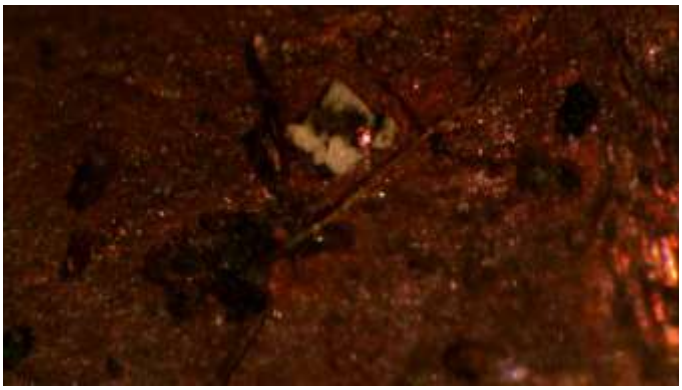
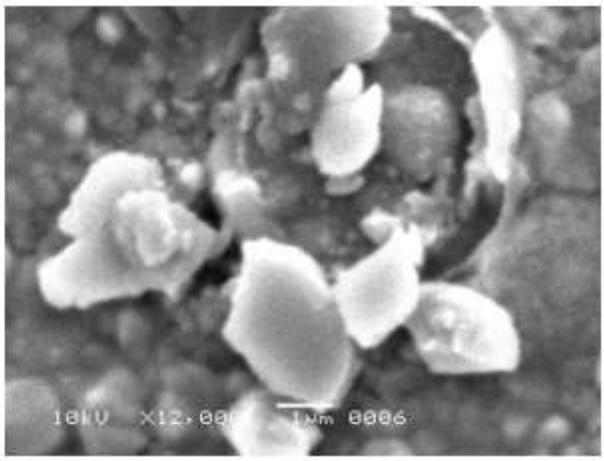
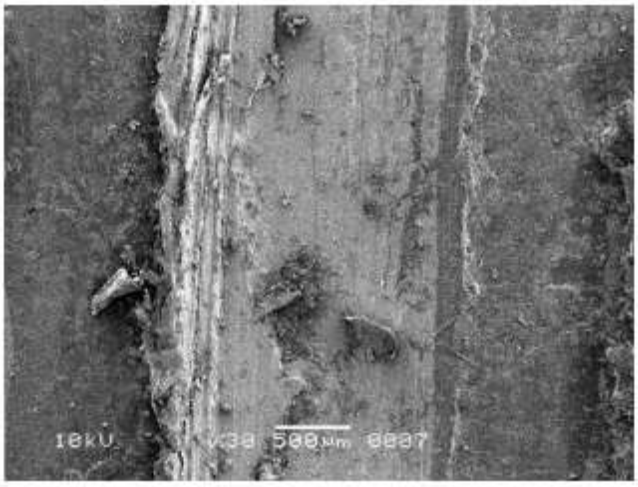


Figure3. Stereo Micrograph shows the presence of severe pits.

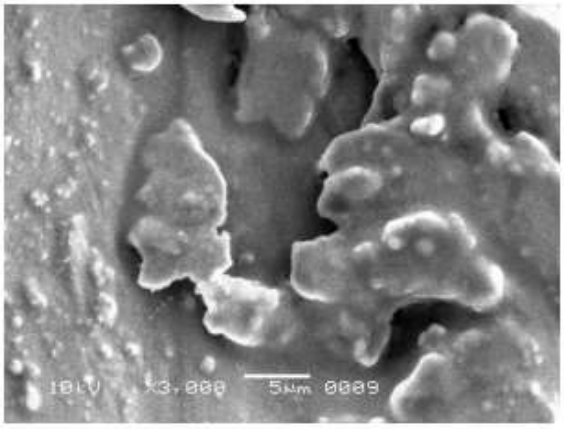
Figure 4. Pitting corrosion at the internal surface of copper tube. The stereograph was taken for the area at some distance from



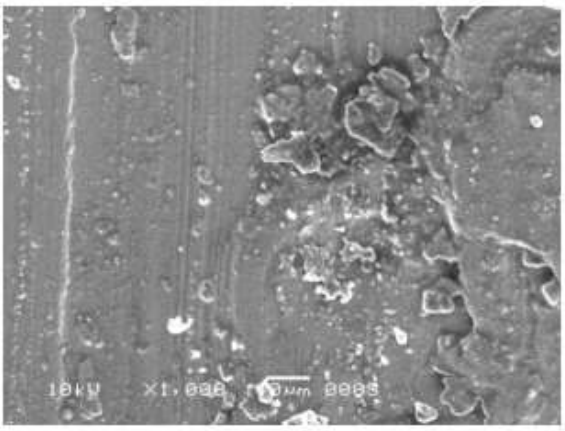
(a) At 12000 X



(b) At 30X



(c) At 3000X



(d) At 1000X

Figure 5 shows SEM micrographs of inner surface, reveals the presence of Cu_2O particles present near premises of pitting corrosion.