



KCM Copper SX Plant Investigation Report

On August 5, 2015, four peoples of our team went to KCM of Zambia, to investigate the locale producing plant and technological process, to talk about the detailed technology with related technician of KCM, and do a locale laboratory test, also discussed the reason of extraction reagent is consumed too large etc. For the found locale producing technical problems, we have below suggestion for our sincere cooperation:

A. The problems of producing technology:

1. The using exaction reagent is M5774, it is a single Aldoxime reagent, the ability of extract high concentration copper iron is strong, also workable for high acid condition, but the reverse extraction ability is poor, in order to raise this ability, it was added a lot of modifier, the modifier will reduce the reagent's stability, also will be nitrified firstly in the repeatedly using process, will induce normal extraction reagent disintegrate and failure directly and quickly, most will become a kind of third phase with the solid particle of lixivium (PLS) then be pumped out from extraction tank, less will be taken out follow extraction raffinate and electrolyte (We can see the red organic phase that is degraded at the exit of raffinate).
2. PLS has a lot of solid particle, so there is a lot of third phase in the extraction system, it will take a lot of reagent, this is one major cause of more extraction reagent is degraded.
3. The extraction technology is: two steps series extraction for high content PLS, low content PLS in parallel extraction, two steps series reverse extraction, does not has washing step. The feature is with high extraction ability, but defect as below: Fist, without washed



organic phase will contain some PLS, the PLS will contain a lot of harmful material, the harmful material will be taken to reverse extraction system, and accumulated in the electrolyte, if there is manganese ion and so on in the PLS, manganese will become Mn^{7+} during electrolysis process, this is a kind of strong oxidizer, will oxidize extraction reagent in the process of reverse extraction, make organic phase degradation and failure. High extraction rate will raise the content of iron ions in the electrolyte, reduce the quality of copper, and reduce the current efficiency.

4. The organic phase reservoir was placed after the position of reverse extraction, can not remove the water that contained in organic phase.
5. After third phase is refloated out and preliminary filtered by horizontal centrifuge, also contain a lot of solid particle, it is returned to the extraction system directly without further purify, will contaminate the extraction system again.

B: Suggestion of process improvement:

1. Base on the above questions, we suggest you use our DZ988N extraction reagent that without any modifier, and use 260# high flash point low aromatic solvent oil, so as to improve the stability of organic phase, reduce the degradation and entrainment of organic phase.
2. Further cleansing the PLS, reduce the solid particle within 5ppm before enter to the extraction liquid. The specific practice is that add two sets of deep cone efficient thickener after the CCD, for the PLS further cleaning.
3. The pipe connection of extraction system can be changed to another way, low content PLS by parallel extraction, high content PLS by two steps series extraction, change one step



reverse extraction to washing step.

- Put the loaded organic phase into organic phase reservoir, discharge the contained water of organic phase then pump to reverse extraction system, can avoid the entrainment of harmful material.
- The organic phase that be recycled by horizontal centrifuge should be filtered by frame filter again then return to extraction system.
- The extraction chamber should be covered by awnings, to avoid the degradation of organic phase by direct sunlight.

C: Specification of No. 260 Solvent Oil:

Item	Quality Specification	Test Method
Appearance	Colorless transparent	Visual inspection
Density (20°C) kg/L	0.82	GB/T1884
Flash point (Open) °C	87	GB/T261
Aromatics content %	1.5	GB/T11132
Olefin content %	1.9	GB/T11132
Sulphur content %	3 ppm	GB/T380
Initial boiling point °C	197	GB/T6536
End boiling point °C	248	GB/T6536

D: Performance comparison of M5774 and DZ988N:

	M5774	DZ988N
Component	Aldoxime & Modifier	Aldoxime & Ketoxime
Density (g/ml)	0.95~0.97	0.91~0.93



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Saturated extraction capacity (%) (V/V)	5.6~5.9	5.1~5.4
Extracting PH value	1.5~2.0	2.0~2.5
Isothermal point of extraction (g/L)	4.7	4.4
Acidity of reextraction (g/L)	200~225	160~180
Isothermal point of reextraction (g/L)	2.3	1.7
Net transfer amount of copper (g/L)	2.4	2.7
Consumption (kg/T Cu)	6~9	3~6
Advantage	High extracting ability, it is workable for high copper ion and high acidity condition	Not only has good extracting ability, but also has good phase separation, easy to reverse extraction, has good chemical stability and strong inoxidability.
Defect	1. Must add a lot of Modifier and Antioxidant, easy to produce 3rd phase, the consumption will be increased. 2. The ability of reverse extraction, phase separation and stability are less than Ketoxime.	Non

For and on behalf of
Zhengzhou Deyuan Fine Chemicals Co., Ltd
郑州市德源精细化学品有限公司

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Authorized Signature(s)

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