MINCHEM

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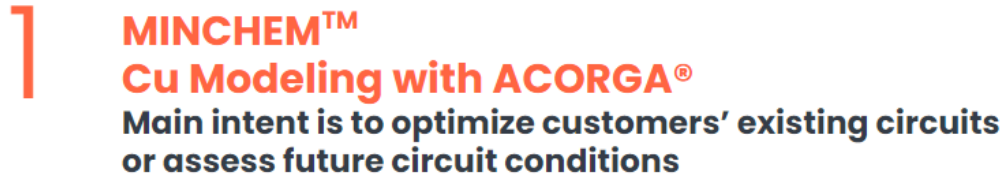


MINCHEM® Application

MINCHEM is Syensqo's proprietary solvent extraction modeling application. MINCHEM gives users the ability to evaluate various circuit feed conditions, plant configurations, and reagent formulations. The program helps identify the optimum extractant for any circuit condition and choose the operating parameters on the plant that will achieve the best metallurgical results. The evaluations are based on McCabe-Thiele diagram construction using real or simulated isotherms.

Two main types of models can be evaluated using MINCHEM: Circuit Design and Circuit Analysis

Circuit Design Models

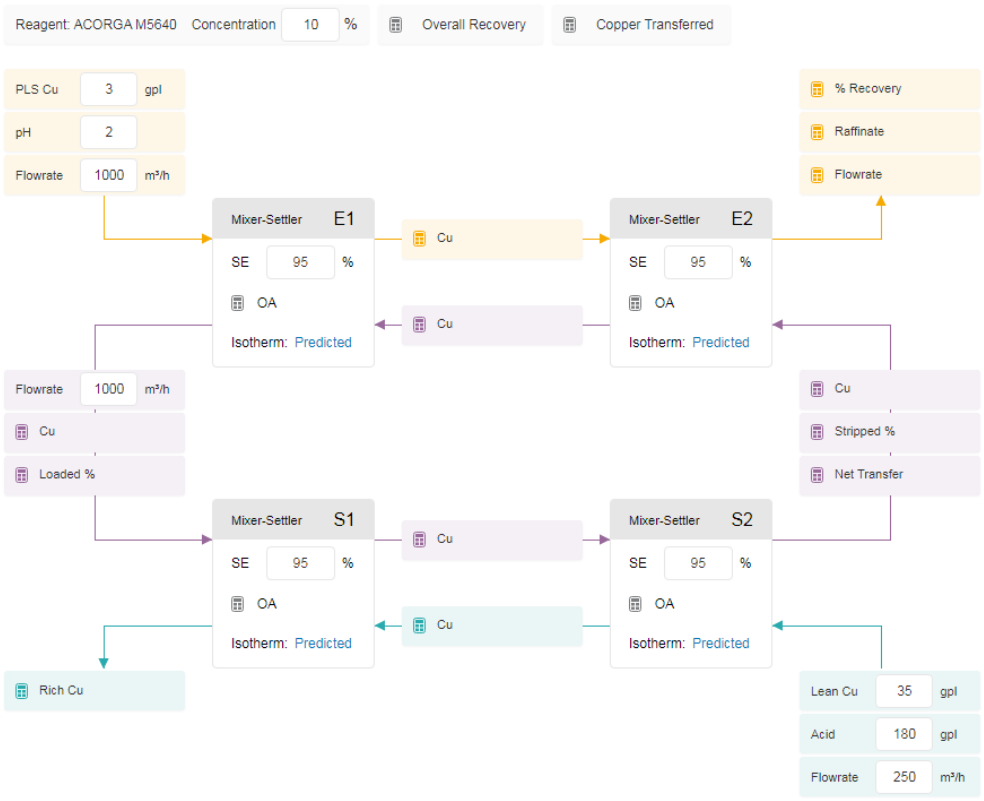
MINCHEM Design mode models allow the user to predict the Cu Recovery, Cu Transfer, and Net Transfer of a circuit given the following input variables:

- PLS Cu grade and pH
- Concentration and type of extractant
- Desired extract O/A ratio or PLS/Organic flowrates
- Lean electrolyte Cu concentration (gpl Cu) or desired strip O/A ratio or electrolyte flowrate
- Circuit configuration
- Stage efficiency

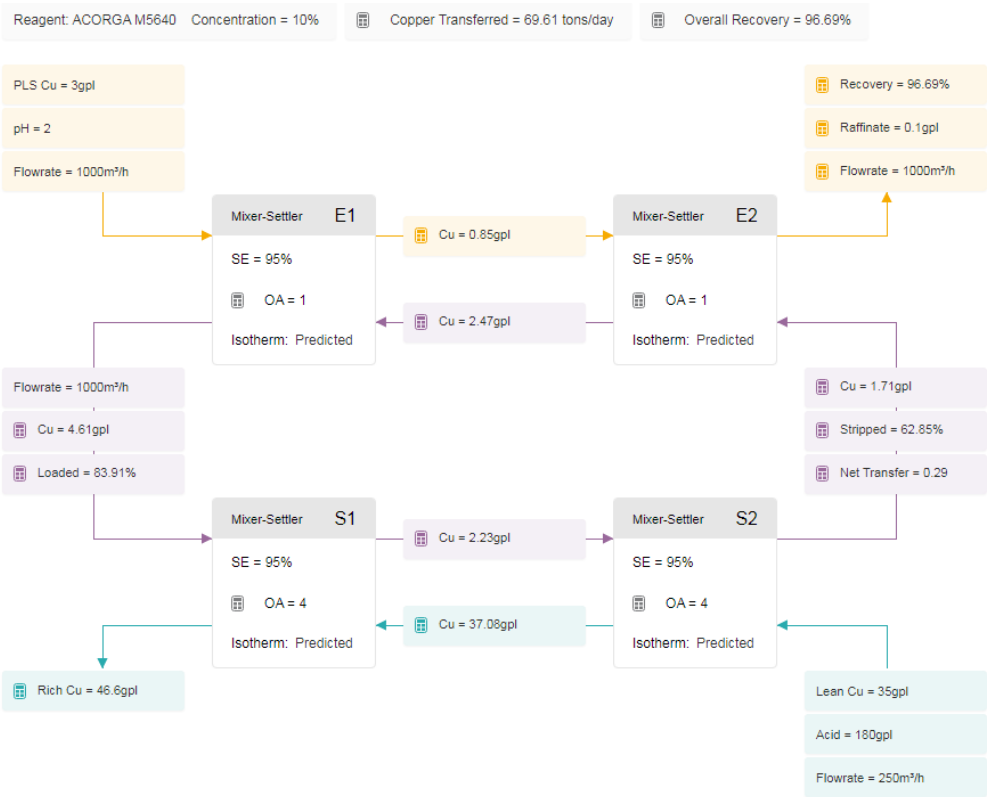
Operator and metallurgists can use MINCHEM Circuit Design models to understand the impact of changes in feed conditions and make the correct operational changes to optimize the solvent extraction process.

Example:

Input conditions

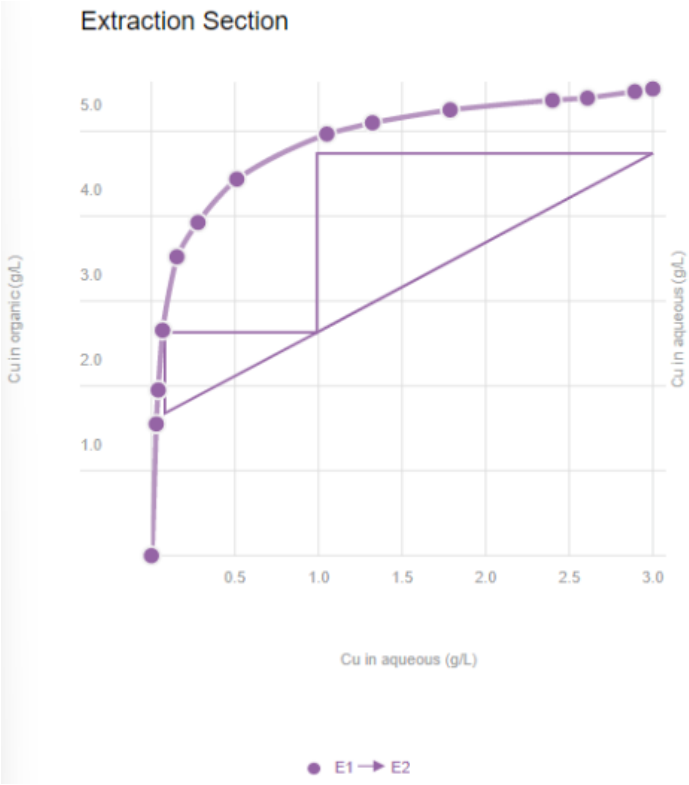


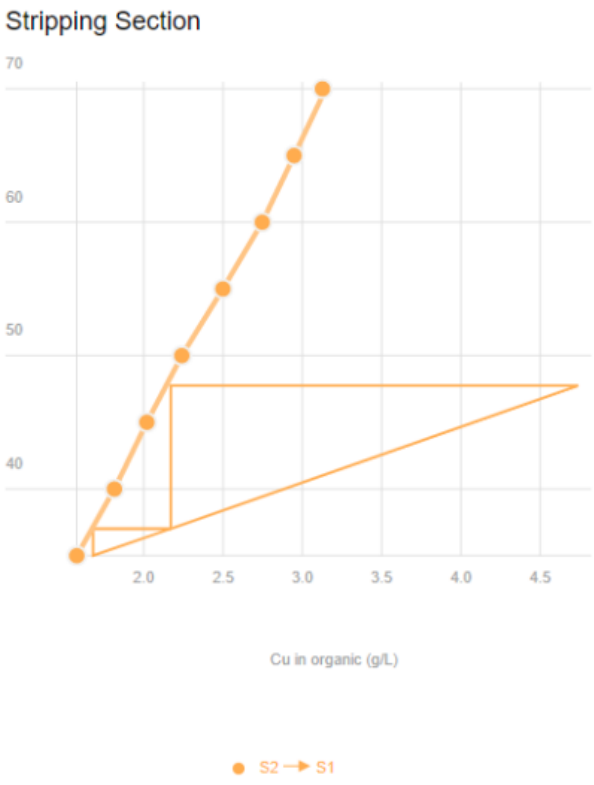
Design mode outputs



Under the operating conditions provided, Cu Recovery is estimated at 96.69%, Cu Transfer is 69.61% ton/day and Net Transfer is 0.29 g/L Cu per vol%. The full McCabe-Thiele plot is available for each model.

McCabe-Thiele Diagram





Circuit Analysis Models

MINCHEM Analysis mode models allow the user to evaluate the performance of a solvent extraction circuit. Analysis of the aqueous and organic copper at the entrance and exit of each stage is obtained and then entered as the input to the model. MINCHEM calculates the stage efficiency and metallurgical O /A ratio to determine the efficiency and stability of the circuit.

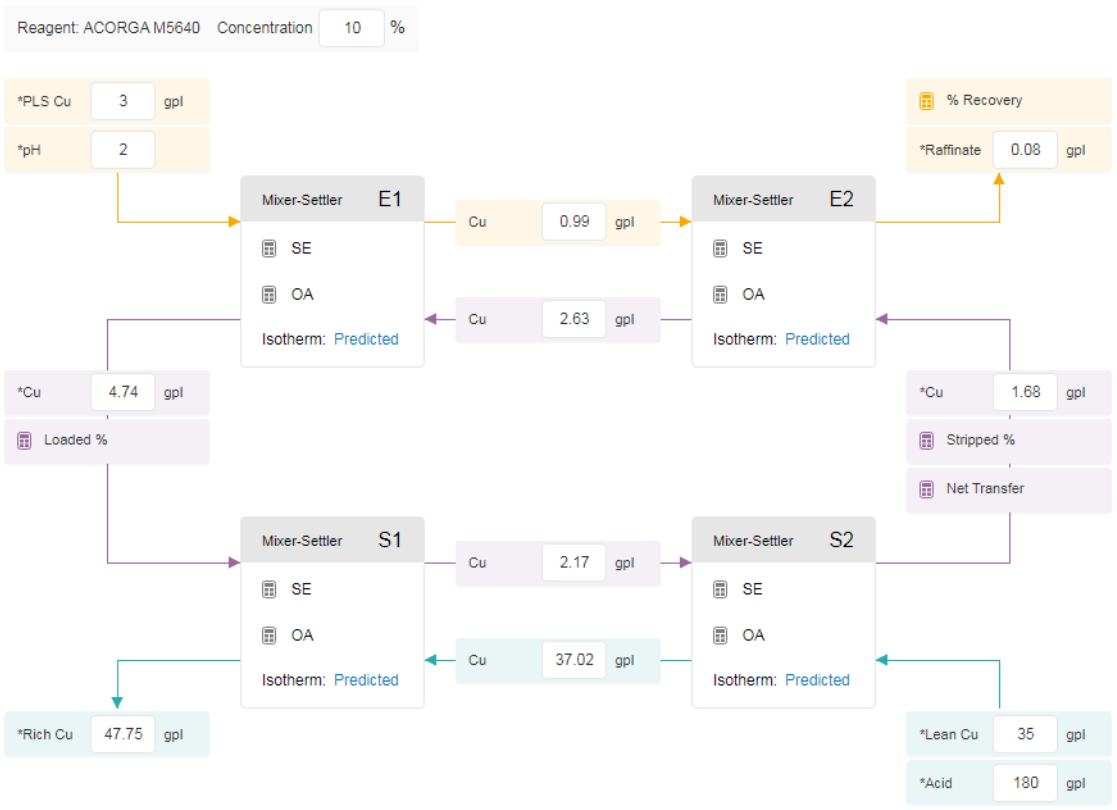
Example:

Stage	Aq IN Cu (g/L)	Aq OUT Cu (g/L)	Org IN Cu (g/L)	Org OUT Cu (g/L)
E1	3.00	0.99	2.63	4.74
E2	0.99	0.08	1.68	2.63
S1	37.02	47.75	4.74	2.17
S2	35.00	37.02	2.17	1.68

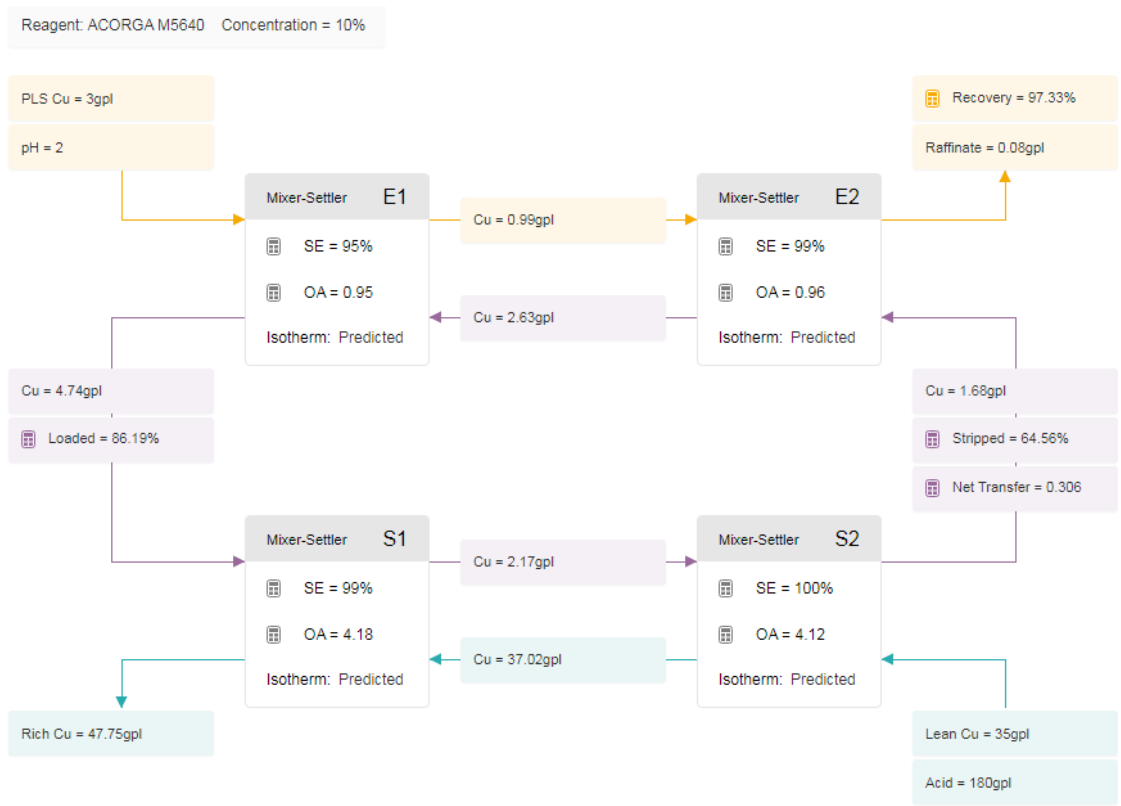
Other Information:

- Concentration and type of extractant: 10 vol% ACORGA M5640
- PLS pH: 2.0
- Lean Electrolyte Acidity: 180 g/L H_2SO_4

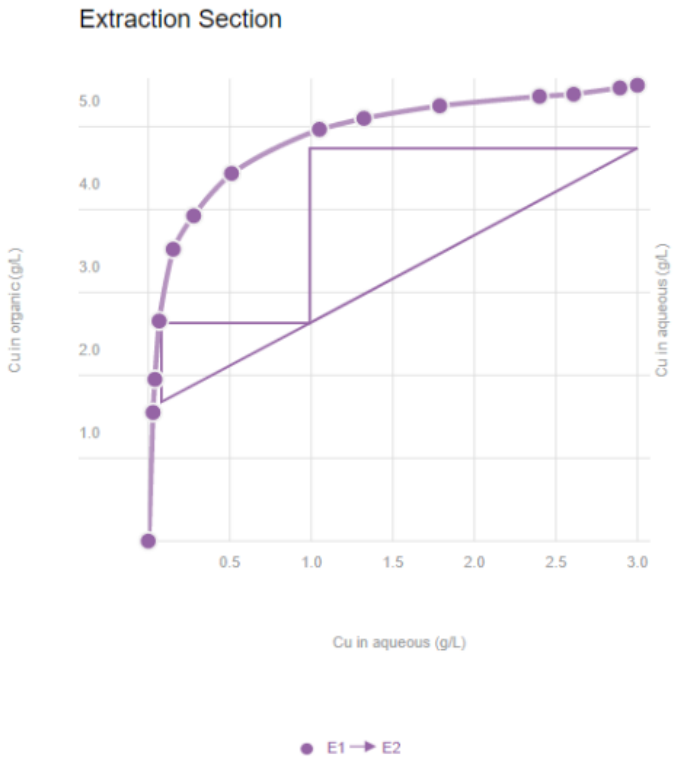
Input conditions

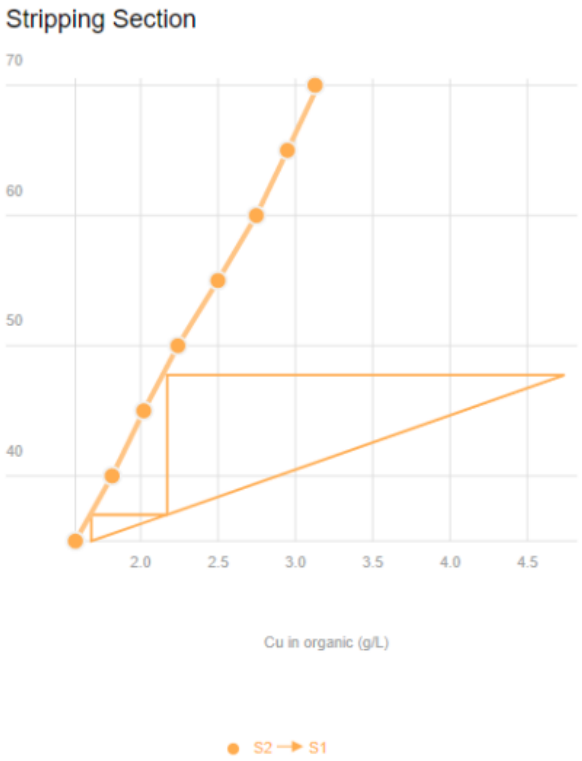


Design Mode outputs



McCabe-Thiele Diagram





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