



An OLI Systems Business Partner
Make OLI your strategy



Making OLI Systems' simulation your strategy

How OLI Systems water chemistry simulation technology
is revolutionizing the mineral processing business



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INSIDE

OLI Systems, Inc. (NJ USA), is a technology leader for electrolyte chemistry-based process simulation applications. OLI software is used by hundreds of companies in many capital-intensive industries to address water chemistry challenges.

In the development of mineral processes, OLI simulation technology often becomes mission-critical to generate cost savings and confidently assess project feasibility particularly when:

- Exploring initial concepts
- Concept development
- Engineering activities
- Commissioning

... as well as in optimizing mining asset operations, and assessing mineral process environmental impact.

Introduction

If you are in a business that involves water and chemistry, then OLI has something for you.

OLI Systems, Inc. is the preeminent developer of aqueous chemistry software and delivers a comprehensive solution that includes data, models and software that can be used to simulate and model a variety of processes across a number of different process industries.

While the scope of this article is focused on the use of OLI software in the mineral processing industries, OLI can be used extensively in any industry wherever aqueous chemistry is found. Here is a quick list of some industry uses:

Mineral Processing	This include concept screening, selection and development, process development, heat and material balances, planning and executing empirical testing (from the beaker to the pilot plant), bringing a newly constructed process online, as a tool to monitor and operate full scale processes.
Oil and Gas	This spans upstream, mid-stream and downstream. Areas where OLI simulation can make a difference include flow assurance, performing scale and corrosion assessments in the design phase, aiding production chemists and consultants to investigate and diagnose problems where water occurs in their production facilities, managing surface water quality, managing contaminated liquid streams.
Chemicals	This includes the designing of chemical production processes, design of experiments for applied research and development and developing pilot plants for assets, processes and compounds
Water Treatment	This includes designing the sequence of water processing steps, modelling reverse osmosis systems including for difficult waters with difficult ions like radionucleotides.

In addition, OLI technology can be used in a variety of other applications including:

- Chemists and chemical engineers as a research and development tool in **Academia**;
- Managing liquid waste streams, fixing ionic balances, generating associated data in **Laboratories**; and,
- **R&D groups** for screening chemistry ahead of testing activities, allowing better / more targeted testing plans to be developed.

What is OLI simulation technology?

OLI Systems' unique capability is providing the world with the most predictive thermodynamic framework for calculating the physical and chemical properties of multi-phase, aqueous-based systems. This framework is applicable to most multicomponent mixtures of chemicals in water, and is predictive over almost any conceivable temperature, pressure and concentration of interest.

The OLI Databank contains proprietary coefficients for the prediction of thermodynamic, transport, and physical properties for over 80 inorganic elements of the periodic table, and their associated aqueous species, as well as over 2,000 organic species. Thus, most mixtures of chemicals in water can be modelled, provided the solvent of the solution is water.

OLI Systems' software portfolio

<p>Chemistry focus</p>	<p>OLI Studio: Stream Analyzer ScaleChem</p> <p>OLI Engine: PIPESIM PVT File</p>	<p>OLI Studio: Stream Analyzer is the flagship OLI software. It is considered a virtual laboratory on your PC and is used for desktop chemistry assessments.</p> <p>Starting with some analytical data (e.g. from a laboratory) the user can generate an ionically balanced input stream, which can then be put to study. A stream can be looked at in fine detail, and all sorts of scenarios can be tested, such as changes in temperature, pressure, pH, composition, bubble point, dew point, vapour fractions, mixing with other streams. A number of different thermodynamic calculations can be applied such as isothermal, isobaric, adiabatic, etc. Redox chemistry can also be studied.</p> <p>ScaleChem is an add-on for OLI Studio, developed specifically for the oil and gas upstream industry to predict and remedy mineral scale formations.</p> <p>OLI Engine for PIPESIM is also for the upstream, used to calculate scale appearance and disappearance in a pipeline, using Schlumberger's PIPESIM + ScaleChem.</p>
<p>Corrosion focus</p>	<p>OLI Studio: Corrosion Analyzer</p>	<p>Corrosion Analyzer is another OLI Studio component. It requires OLI Studio: Stream Analyzer because the solution thermodynamics are the first building block in understanding the corrosion environment. Features specific to corrosion include: a variety of ways to generate Stability Diagrams, for the thermodynamics of corrosion; a corrosion rate calculation for a rate of uniform corrosion, calculating polarization curves as part of this analysis; a localized corrosion indicator, and an ability to predict remaining asset life built on a statistical model using pit depth, area and time of samples</p> <p>This component is used by material scientist and corrosion professionals to predict corrosion rates of a set of streams against a range of different materials / alloys.</p>
<p>Process focus</p>	<p>OLI Flowsheet: ESP OLI Engine in ...</p>	<p>OLI Flowsheet: ESP is used to develop mass and energy balances for a process. It can be used to monitor an existing process, or I can be used to develop a new process all the way from conception, through the engineering phases, and into operations. This is a tool for flowsheet simulation when electrolytes are the primary chemistry in a process.</p> <p>OLI Engine in <Alliance Products> is another way to access OLI simulation technology. It is the ability to use OLI as a property method inside the SysCAD, IDEAS, Aspen Plus, Aspen HYSYS, UniSim Design, PRO/II and gPROMS simulators.</p>
<p>Your focus</p>	<p>OLI Engine: Developer Edition</p>	<p>The OLI engine is available to be used as an API by other software developers, so that they can bring the power of OLI to their flow sheeting platforms.</p> <p>It can also be used to develop custom excel spreadsheets that are tailored to a client-specific need. This is especially true to screen automated data collection, where hundreds of samples can be analyzed for a pH or scale tendency or corrosion rate.</p>

OLI in the development of mineral processes

Exploring initial concepts

When mining projects are in their infancy there is usually little information available. However, there should be some useful information available, such as ore characteristics or liquor information, as well as some quality information of the local surface / ground water.

Based on this little information, OLI simulation technology can be put straight to work. When there is some information on the ore resource, and the intention that the ore will be leached, then clients can start to generate information that can be used to build some initial processing concepts. This is a powerful use of OLI to screen profitability and feasibility early in the lifecycle of a project.

In this scenario, OLI software can predict the compositions of the resultant liquor across a range of conditions, and reagent types and concentrations.

Based on this information, OLI software can then be used to investigate and screen possible liquor processing concepts, where the intention is to process the liquor through a number of purification and separation steps, so that the valuable minerals can be recovered efficiently.

Thus, right at the beginning of the development phase, it is possible to start to generate some reasonably high-quality concepts that can be used to estimate high level economics, and which are ready to use in the concept development phases.

Using OLI software this way is highly productive, generating high quality information in a very short time frame.

Concept development

The initial concepts can then be developed with the intention of developing process concepts that can be used as basis information for early engineering activities.

It is likely that initial empirical testing activities will occur, and OLI software can help steer the development of testing plans and help identify useful tests to perform. Then, good practice would seek to benchmark some of the predictions made by OLI software with some real physical testing. It is important to gain confidence in the ability of OLI to make accurate predictions, so that OLI can be put to better use as the development of the project is progressed. Once there is confidence that OLI software can accurately model a chemistry and process, real strides can be made in developing an optimal process.

The initial concept can then be expanded into a preliminary process flow sheet. This would include additional streams on the periphery of the core concept, as well as some integration such as the inclusions of stream recycles and heat transfer equipment. OLI also assists with the preliminary sizing of equipment. It is especially useful for the preliminary sizing of (expensive) thermal processing equipment such as evaporators, which can then be used for early vendor engagement.

In summary, in the concept development phase, there is often a succession of empirical testing stages. OLI simulation technology can help guide the testing program along the way.

Engineering activities

During the engineering phases, OLI simulation technology can also be mission-critical. OLI Systems can help resolve issues as they arise, which is particularly useful so that issues can be investigated and closed out as soon as possible.

OLI software can be used to examine areas of the process in more details, especially with regard to deviations from the steady-state mass balances. What happens if a stream cools down? What is the effect of transient flows across the process? Is a particular material of construction suitable for the service? Where are scaling problems likely to occur? These questions can be quickly answered and thermodynamic feasibility – and infeasibility – quickly assessed.

During the HAZOP and other safety studies, OLI can be used to answer questions and guide a study into best practices.

OLI Systems provides the engineering team with access to instant answers of a high quality, which reduces the reliance on outside influencers and minimizes engineering related delays.

Commissioning

Once the process has been constructed and is in the process of being brought into operations, there is a higher risk of making mistakes.

There are unusual volumes of liquid to manage and the commissioning team has to be careful not to cause additional problems.

Assuming that the laboratory is in operation, then it is possible to use OLI to effectively monitor and manage the various liquid inventories with the intention of avoiding problems such as scale and corrosion.

OLI for operating mining assets

OLI software is useful in developing assets, OLI can also be used to help manage processes that are in operation. Activities where OLI cases can be setup include:

- Modelling the process and benchmarking it with analytical data generated from sampling
- Using the benchmarked model to assist the improvement of the performance of the process
- Debottlenecking initiatives
- What if type predictions
- Monitoring and remedying operational problems associated with scale and corrosion
- Management of waste streams on site

For these activities, an entire process can be translated into OLI, or simply parts of the process can be examined more closely in off-line queries. A user can explore responses to trend changes in temperature, pressure, pH and concentration. Several schemes can be tried and the best one selected, reducing lab costs and pilot plant tests, focusing on what is likely to work rather than an arduous physical screening process.

OLI for managing the environmental legacy

Unfortunately, there are too many examples where past mining activities have left poor environmental legacies.

OLI can assist your project so that it leaves a good environmental outcome. OLI can be used to plan and manage the quality of waste streams from mining projects, including predicting which scenarios are more likely to lead to poor outcomes as well as how to process waste streams where clean-up treatment is necessary.

Accessing this Technology

To find out how your business can benefit from OLI technology, please contact alex.vorster@blueironcove.com and mention this brief to arrange a free Application Assessment.

For more Information

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