

Discover Patterns  
that Matter

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“With our services,  
you can gain insight,  
anticipate the next  
move and act with  
confidence”



**PATTERN DISCOVERY**  
TECHNOLOGIES INC

## **Case Study:**

### **Oil Sands**

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## ● Case Study ●



Oil sands block models are typically populated with geological properties such as facies designation and physical properties such as bitumen concentration, average particle size (D50) and fines concentration. In an effort to deliver consistent feed to the extraction circuit, mining operations attempt to blend ores based on these physical properties. However, these properties alone are not necessarily the strongest influences on extraction circuit performance. It is generally accepted that many other characteristics of the ore such as the chemical components (pH, Ca, K, Mg, etc) and the mineralogy (MBI, etc) combine with the other known factors to influence the

overall performance. Better understanding of the interaction of these factors and the degree of influence these factors have on the extraction circuit is critical to improving the overall process. This understanding can help refine the control strategy needed to reduce future plant upsets and improve the recovery process.

Pattern Discovery methods provide a unique approach for associating ore properties with plant performance indicators such as primary recovery and froth quality. With records of batch extraction tests against a set of strategically selected core samples, the system:

1. Discovers relevant patterns in the ore that noticeably influence the performance indicators. In this phase of the discovery, hidden relationships that underpin the system behavior (i.e. non-obvious relationships between ore properties and performance indicators) are discovered and quantified *automatically*. The discovery process utilizes a unique “rule based” classifier that compares the actual plant performance with expected plant performance. Because the discovery activity is driven solely by the data, it eliminates any bias of individuals interpreting the circuit performance
2. Transforms the patterns that are discovered into production rules that can be used to anticipate the performance of different ore types. Confident measures such as the probability of occurrence are provided to help support the prediction rules. The measures also help inform the plant experts on the relative importance of the rules.



With a predictive rule model learned from batch extraction tests, one can now classify all geological or mining blocks of the mine according to their potential processing performance. For example, a tag of primary recovery can be assigned to each block in the mine. This information can greatly help optimize mine planning and provide the extraction circuit with consistent ore feed in terms of processing behavior. Because of the transparent nature, this proposed system not only assigns a performance value to a block, but also reveals the reasons behind the assignment. Understanding the underlying cause for poor performance can lead to the development of the most effective mitigation strategies – altering chemistry characteristics in the control room or changing physical characteristics by blending the ores. The approach also makes applications such as shovel simulation and feed forward control possible.

Based upon this information, Pattern Discovery Technologies developed the application, **OreInsight**, which provides users with multiple views of their geologic block model, superimposed on their existing mine and process facility maps. By selecting any block, a prediction is provided as to the processability of the ore according to a user-selectable performance model. The model can be either based on maximum bitumen recovery or maximum froth performance, and the ore processability is colour coded in the block model visualization. This is now a tool for both mine planning and process planning -

1. The ore extraction plant can now have visibility into the processing requirements of the ore arriving at the plant and be prepared with the appropriate treatments
2. The mining process can now be jointly planned on both the accessibility of the ore body AND the processability of the ore in that area.

For More information on **OreInsight** and our **Insight** suite of applications, please contact us or visit our website at [www.patterndiscovery.com](http://www.patterndiscovery.com).

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