How the IBM Analytics Mediation Platform fulfills business goals in the mining industry

Maximize productivity and manage risks with the IBM Predictive Maintenance and Quality (PMQ) solution

Saurabh Gupta (sgupta18@in.ibm.com) 28 July 2015
Solution Architect- Predictive Asset Optimization
IBM

Seba Kauser (seba_kauser@in.ibm.com)
Application/System Integration Specialist
IBM

Companies have access to more data than ever, but the data is often in disparate systems and dissimilar formats. Put this growing volume of data to work generating real-time insights that lead to meaningful actions. Learn how IBM's Analytics Mediation Platform (AMP) helps customers in the mining industry gain more control over mining operations, accounting, and production predictions.

Background

The mining industry is as vital to today's global economy as ever, yet it is at a crossroads. It is an industry that is combating multiple adverse global trends such as falling commodity prices, a slowing global economy, and skilled labor shortages.

Just like the adoption of any new process in the mining industry, the adoption of new technology usually must improve the bottom line or meet a mandated requirement. Sometimes, the lack of integrated data due to its presence in dissimilar systems and in disparate formats makes it difficult for organizations to adapt to new information technologies. Because of this, bringing new technology into this industry is a time intensive and challenging phase for most companies.

There is a need for an effective effort to improve the standard and activities of mining-related areas by adopting the use of technology in all its dimensions.

© Copyright IBM Corporation 2015
How the IBM Analytics Mediation Platform fulfills business goals in the mining industry
Typical IT requirements in the mining industry

Any IT solution or offering would meet the requirements of a mining company CXOs and its line of business team only if there is collective effort and research collaboration within the company. Major areas identified are: Improved Recovery/ Grade Confidence, Price Realization/ Avoiding Penalties; and reduction in operating and capital expenditure costs.

Enterprise integration

This solution helps mining companies manage their resource and reserve across various sites. It provides an information tunnel to update the GeoInventory information in Enterprise Resource Planning (ERP) systems to create production orders.

Risk management

Mining is inherently dangerous. And it's not the physical risk. The goal to have a sustainable mining project also needs to be considered for a Risk Management solution. The company should be able to predict the optimal working conditions for its employees and heavy machineries.

Planning and scheduling

This solution is very critical in meeting the production and financial targets of the company. It helps in detailing the resources involved in various development phases of the mining project; what kind of work has been assigned to them; tracking of this schedule by using a plan. Based on the plan, a phased schedule is created to tackle the existing and expected delays and financial implications.

Optimization

An optimized plan and schedule is required for implementing a mining project based on the ongoing constraints of the mining project. This should not be avoided. Optimization re-aligns the project resources and corresponding implementation tasks to deliver profitable outcomes.

Operation control

Having full control on the production processes helps in making sound mining decisions and avoids costly mistakes. This solution should optimize the processes involved in a mining project by providing recommendations such as an effective maintenance schedule and an operational failure matrix.

Analytics as a booster

The IBM Predictive Maintenance and Quality (PMQ) solution is based on IBM’s Analytics software products. The products are based on open architecture and bundled with content required for various industries to provide capabilities to high-level business objectives, such as capital planning, operations management, inventory optimization, and more.
Predictive Maintenance and Quality meets the majority of the IT requirements of the Mining Industry. The solution uses information collected about products, processes, and assets to optimize maintenance schedules, production processes, and product quality.

Business partners such as MineRP, have developed sophisticated Mine Technical Systems (MTS). They used their knowledge of amalgamating the raw data from various sources of data that include silo mining applications and human knowledge such as Surveyors, Geologists, etc. IBM developed Analytics Mediation Platform (AMP), as an attempt to bring advancement in mining scenarios to benefit mining companies using MineRPs one of the MTS known as GeoInventory system as data source.

AMP uses IBM PMQ and adds Mining industry content from MTS to fill the gaps and demonstrate a working prototype that includes:

- Near real-time integration between ERP solutions and MTS to provide a connection between Business Planning and Accounting
- Aggregation of historical interactions ensuring unprecedented auditability across the total mining value chain
- Classification of Mineral Inventories based on resource and reserves reports
- Forecasts of the volume of tonnage based on the historical performance of the mine site and the confidence of the reserve reported by MineRP’s MTS

The solution architecture of the AMP solution is shown in Figure 1.

**Figure 1. Analytics Mediation Platform – Solution architecture**

**Requester applications**

Requester applications are required by different stakeholders to get near-real time inventory status to generate reports and create production orders. For example, Figure 2 displays confidence of platinum ore updated in the respective requester applications for a given mine block.
Figure 2. Classification/Confidence of the reporting block is changed from Indicated to Measured. Production Order is created for that block

The SAP MM (IM) Module is implemented for procurement handling and inventory management in mining companies. The Inventory data exchanged via this interface is used in SAP MM (IM) application for the purpose of updating the state and status of the mineral asset.

Resource and Reserve reports developed in the visualization layer provide the inventory (Volume, Grade, etc.) of the Ore body at different phases. The various phases are:

- Exploration
- Mine planning and capital raising
- Development of an underground mine
- Tactical mine design and scheduling
- Operational mining activities

Analytics Mediation Platform

With the help of integration with MineRP's GeoInventory application and SAP MM, Analytics Mediation Platform provides contextualized state and status of mineral assets. This IBM PMQ based solution takes data into the analytical data store of PMQ using the mediation flow of IBM Integration Bus (IIB).

The event payload, shown in Figure 6, is aggregated and correlated with the master data to generate the key performance indicators and SAP payload to create production order in SAP MM (IM) module. The master data is designed using the industry standard data model to represent the different entities of the mining enterprise. This hierarchy shown in Figure 3 helps requestor applications to associate the inventory with appropriate material and site.
Figure 3. Mining meta model

AMP uses PMQ's IIB SAP Adapter to send requests to the SAP MM (IM) module as shown in the mediation flow in Figure 4.

Figure 4. IIB Mediation flow to invoke SAP RFC

IBM Cognos reports are built to dynamically pick data from the data store to be referred to by the operators of the company. The graph shown in Figure 5 demonstrates the difference between Resource and Reserve over the life of the mine (Deep Mine 2). The graph also attempts to explain the reason, or at least the sources, for these differences.
The advanced analytics engine of PMQ is used to forecast the Tonnage volume based on the historical production data that persists in the operational data store of AMP. The forecasted value derived is by the time the series model is evaluated against decision rules. If there is any deviation in the production numbers planned for that particular financial plan, a recommendation is generated.

**Provider applications**

MineRP provides a GeoInventory management system which enables continual collection and assimilation of data to enable the tracking of change in state and status of the mineral deposit over time. This is called Mine Asset Management. By means of this system, transactions based on state and/or status changes of the corresponding mineral resources and reserves are pushed out of the system in the form of well-formed CSV files. These files contain critical information pertaining to the mine, including:

- The site of the ore body
- Classification of the ore
- Dimensions and measurements of the ore

**Figure 6. Inventory Payload**

<table>
<thead>
<tr>
<th>ROuid</th>
<th>TransId</th>
<th>SiteName</th>
<th>Classification</th>
<th>Discipline</th>
<th>Period</th>
<th>TransDate</th>
<th>Area</th>
<th>IsOnReef</th>
<th>Reef</th>
<th>Density</th>
<th>Tm3</th>
<th>Valuweight</th>
<th>OrGrad</th>
<th>Height</th>
<th>Grt</th>
</tr>
</thead>
<tbody>
<tr>
<td>01770B03-CBEF-4D79-93D6-0007F2186B6C4</td>
<td>3577051594</td>
<td>DeepMine 2</td>
<td>Inferred Resource</td>
<td>SURVEY</td>
<td>201408</td>
<td>7/11/2014 0:00</td>
<td>17</td>
<td>1</td>
<td>MRE</td>
<td>3.2</td>
<td>4.63</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01770B03-CBEF-4D79-93D6-0007F2186B6C4</td>
<td>3577051594</td>
<td>DeepMine 2</td>
<td>Indicated Resource</td>
<td>SURVEY</td>
<td>201408</td>
<td>7/11/2014 0:00</td>
<td>17</td>
<td>1</td>
<td>MRE</td>
<td>3.05</td>
<td>1.59</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01770B03-CBEF-4D79-93D6-0007F2186B6C4</td>
<td>3577051594</td>
<td>DeepMine 2</td>
<td>Measured Resource</td>
<td>SURVEY</td>
<td>201408</td>
<td>7/11/2014 0:00</td>
<td>17</td>
<td>1</td>
<td>MRE</td>
<td>3.2</td>
<td>4.63</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01770B03-CBEF-4D79-93D6-0007F2186B6C4</td>
<td>3577051594</td>
<td>DeepMine 2</td>
<td>Probable Reserve</td>
<td>BUSINESS PLAN</td>
<td>201409</td>
<td>8/8/2014 0:00</td>
<td>3</td>
<td>1</td>
<td>MRE</td>
<td>3.18</td>
<td>4.52</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01770B03-CBEF-4D79-93D6-0007F2186B6C4</td>
<td>4280638292</td>
<td>DeepMine 2</td>
<td>Proven Reserve</td>
<td>BUSINESS PLAN</td>
<td>201409</td>
<td>8/8/2014 0:00</td>
<td>3</td>
<td>1</td>
<td>MRE</td>
<td>3.2</td>
<td>4.63</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

The implementation of advanced analytics and the timely use of information generated have the potential to optimize overall mine productivity and further reduce unit costs under variable mining and economic conditions. This article aims at assisting teams working with mining companies to help them gain a better control on the mine states, productivity and availability of on-the-go information in easily accessible applications by using the power of AMP based on IBM PMQ.
Resources

- Learn more about predictive maintenance.
- Visit the IBM Predictive Maintenance and Quality Knowledge Center.
- Watch the demo "Predict the future to keep your production line running" to see how IBM Predictive Maintenance and Quality helps you avoid surpluses and shortages in your raw material inventories.
- Learn more about MineRP's Mine Technical Systems (pdf)
- Download the free eBook Predictive Maintenance for Dummies.
- Learn more about predictive maintenance and IBM's solutions when you download a demo, whitepaper, case study and more.
About the authors

Saurabh Gupta

Saurabh Gupta is a solution architect at IBM with more than a decade of experience creating architecture for and evangelizing solutions. He has played key roles in several projects — from project planning to implementation for various customers in growth markets. He is currently associated with the Predictive and Business Analytics Industry Solution and Services group at IBM India. He plays an important role in creating business analytics solutions for predictive asset optimization.

Seba Kauser

Seba Kauser is with Global Business Services at IBM India and is currently part of the Industry Analytics Solutions Services, India Software Labs team. She leverages her IBM Predictive Maintenance and Quality skills to work with customers in domains such as- Oil and Gas, Mining, etc. Her interests include application integration and middleware using WebSphere products. She has authored other developerWorks articles such as- Real-time data analytics using IBM Predictive Maintenance and Quality and Integrate IBM Predictive Maintenance and Quality (PMQ) with ILS deviceWISE to onboard high-value asset data.

© Copyright IBM Corporation 2015

Trademarks
(www.ibm.com/developerworks/ibm/trademarks/)