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Plants Processing In Cole Mining

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ABSTRACT
In addition to meeting Government Policy on Energy Efficiency Opportunities (EEOs), mining and mineral processing companies are increasing energy efficiency to reduce costs in the current financial conditions. One of the major issues with EEOs is the lack of data available on energy use, and more importantly the energy use linked to production data, that identify energy reduction opportunities. As well as energy reduction, mining and mineral processing companies often struggle with the prediction of energy use, and are often penalised for under or over forecasting. Once again it is the lack of timely information that makes this prediction difficult. This paper looks at expanding the use of a Manufacturing Execution Systems by integrating with Energy Solutions. This will provide automatic, timely information, at a granularity that makes it easier to identify EEOs, reduce energy costs, and better predict energy use in a mining and mineral processing operation.

INTRODUCTION

Both the financial and atmospheric climate are key discussion points in 2009. Mining and mineral processing companies are looking at both reducing energy use to lower costs, and to reduce emissions, particularly in light of any carbon emissions scheme that may be introduced. To achieve this, companies must have a clear understanding of their current energy use, and therefore require tools that will empower people to make decisions. Governments are recognising the potential for energy efficiency, particularly in the mining sector. Many are introducing Energy Efficiency Opportunity (EEO) programs, which encourage large energy-using businesses to improve their energy efficiency by identifying, evaluating, and reporting publicly on cost effective energy savings opportunities. Many governments are making participation in Energy Efficiency Opportunities mandatory for corporations that use more than 0.5 petajoules (PJ) of energy per year. One of the reasons behind the EEO program is that Governments believe that increased uptake of cost effective energy efficiency technologies and process, will help businesses maintain competitiveness under a carbon pollution reduction schemes as globally we move towards a low carbon economy.

Energy Forecasting and Events of Excess Energy Use

In discussions with mining and mineral processing companies it became apparent that they are facing common problems as they attempt to do more using less energy. The challenge for mining and mineral processing companies is that they currently don't have sufficient information to make decisions to reduce energy (identify EEOs), or forecast energy use

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accurately. Complex energy forecasting tools are available to better forecast energy use, but don't take into account the context of excess energy use, or the historical and future production data, therefore not delivery accurate forecasts. Mining and mineral processing companies are investing in meters and enterprise Energy Management (EM) software to monitor and visualise/report on energy use. Providing information on energy use is only partially solving the problem of determining new opportunities to reduce energy use, and in turn comply with EEOs. Along with energy use, information's required on what is actually happening in the plant at the time, in other words there has to be context supporting the energy use. For example near real time information like kWh/tonne or kWh/ounce of production. Mining and mineral processing companies tend to have information systems that provide production and delay accounting (downtime) information, but do not combine or integrate with energy systems to provide more useful information. This level of information provides accurate forecast models and perhaps new EEOs. Production and downtime are obviously key factors in energy use, therefore integrating production and energy systems have potential benefits.

Examples of Energy Events

If an MES is already collecting downtime information of large mining assets, along with production figures, it is efficient to integrate this with energy information to provide useful "energy eventing" information. This data can then be easily reported and visualised together. See figure 5. There are many reasons why an increase in mill energy use could spike. For example, if the same throughput is required within a mill, and the feed material is a harder or more competent ore, energy use can increase by over 10%. This information about ore competency could be available historically in the MES. Similarly if the grind size had to reduce by half to maintain recovery rates during flotation (due to liberation issues with an ore), energy will increase in excess of 10%, more likely to be a factor of four. Once again this information about liberation changes could be available historically in the MES. In both these cases the integration of existing data into a Production Energy Optimisation (PEO), could provide visualisation in near real time with such parameters as energy/tonne, cost/tonne. PEO visualises downtime with energy information through drill down functionality to identify context with energy use.

Production Energy Optimisation systems support:

1. Automatically capturing events:
a. Start and end time, duration, excess energy used
b. Plus context information – material, product, grade, crew, shift,
c. Automatically or manually split events
2. Knowing when your equipment is consuming too much energy and by how much
a. When demand (kW) is over a target
b. When kWh/ton is over target

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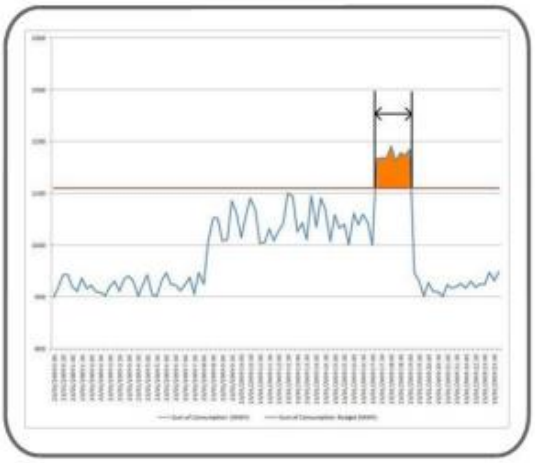
Figure 5: Energy Events Graph



Start Time	End Time	Duration (mins)	Over (MWh)	Classification	Cause	Shift	Crew
23/1/09 17:15	23/1/09 19:00	105	514	Process	Poor Feed	Afternoon	Crew C

Figure 5 illustrates an "energy event" where over consumption of energy occurred. The MES captured context around this event and poor feed was attributed to the over consumption of energy.

Energy Forecasting

When failing to meet a forecast (either over or under) incurs monetary fines, tracking energy consumption against forecasts becomes very important. Mining and mineral processing companies need to accurately forecast energy consumption and have timely access to actual energy consumption so that decisions can be made. Sophisticated mechanisms for modeling energy consumption are needed to generate a forecast. These models are available as part of an Energy Management solution and use regression and correlation based on ASHRAE Guideline 14. They assist in identifying the factors/drivers that affect energy consumption, and then develop algorithms that can forecast energy consumption. To do this type of modeling more effectively requires the production and downtime data that an MES provides.

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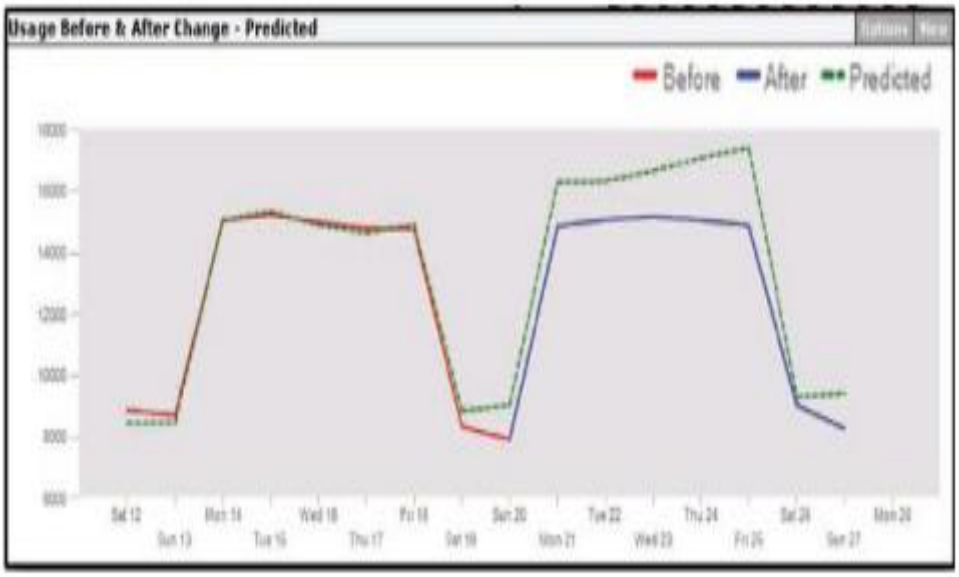

By integrating MES and EM systems, the energy model can easily be derived from historical process data, with the MES providing future process data like production plans, shift targets, and upstream feed grade.

RESULTS AND RECOMMENDED SOLUTION

Importance of Operations Data (already captured in MES) The importance of the data already captured in the MES cannot be under estimated. The value lies in linking it with energy data. Many vendors are looking at providing energy solutions; however the improved value proposition is not having an MES and an EM system, but an integrated Production Energy Optimisation solution.

Recommended Approach By combining automatically

Captured data on production and downtime in the MES, and energy use in the EM system, energy efficiency benefits can be realised. To maximise the benefits it is suggested that the information be not only combined but also displayed together. This type of integrated solution we have already referred to as Production Energy Optimisation. The best approach would be for the Production Optimisation Solution to enable:

- Real time Energy Consumption Reporting
- Forecasting of energy consumption based on certain parameters
- Establishment of optimal energy consumption target for each section of an operation
- Identification and quantification of all consumption above the target
- Discovery of root causes of over consumption
- Report on shift or daily consumption and over consumption events
- Real time calculation of sustainability KPIs such as kWh/tonne
- The provision of validated actual data to justify future capital expense and/or process changes

To systematically, reduce energy consumption in the minerals processing environment we recommend the following process:

- Identify the energy drives for your plant. E.g. material grades, recovery rates etc
- Report in real –time the energy consumption as well as the energy drivers

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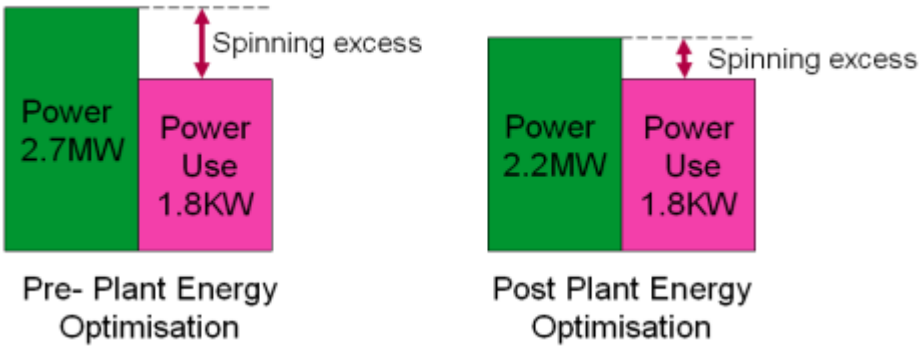
● Use an energy model to forecast the energy consumption based on the forecasts of your energy drivers
● Use this forecast to determine an energy target
● Identify and qualify all consumption above the target
● Analyse results to determine root causes of overconsumption Over consumption may be caused by failing equipment and could be another trigger used to optimise maintenance programs. Real-time metrics can also help to drive behavior. KWh/ounce can be easily calculated and displayed so that operators know how the plant is performing in terms of production and energy. By collecting accurate records on the causes of energy consumption above target, this data can be used to support capital expenditure required to change process equipment.



: Reducing Spinning Excess Using Plant Energy Optimisation Example

CONCLUSION

Manufacturing Execution Systems (MES) are commonly used in mining and mineral processing companies, reporting key data and KPIs around production and downtime. Their information empowers managers to make decisions that may improve business excellence. Energy Management (EM) solutions are increasingly being installed in mining and minerals processing companies to provide information for tracking operational consumption, forecasting consumption and providing information around energy quality. Like MES, the information provided is useful for better understanding energy consumption. The information empowers people to make decisions that may improve business outcomes by reducing energy use or better forecasting energy use. Both MES and EM systems have their use in mining, by providing automated, accurate information in a timely manner. It is however the integration of both systems that will provide more value when endeavors are made to better understand energy use, and therefore potentially reduce energy use. The integration of MES and EM solution to form a Production Energy Optimisation (PEO) provides added value. Using PEO energy events can be identified, the reasons for them understood, and perhaps preventative action put in place to reduce or stop them recurring as frequently.

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