SMART Mine Benchmarking – Pilot to the Future

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Abstract

SMART, an association of surface mining companies formed in 1995 to develop a coordinated approach to technology development for the mining industry, has recognized the need for the establishment of a worldwide database that continuously collects mining equipment data and provides metrics related to productivity and cost.

Under the auspices of SMART, Syncrude Canada, Suncor Energy and Albian Sands Energy (three oil sands mining operations located in northern Alberta) have established a pilot project for mine benchmarking. This presentation will include a review of the pilot progress including:

- Data gathering techniques: means of collection and storage, proposed practice for data control and normalization, access to data/reports and format for data.
- Reports/analyses for individuals, across groups, within the total industry pool and publicly.
- Security and confidentiality of information belonging to identified parties.
- Sharing of best practices among members.

SMART has identified two key deliverables to ensure success of the project. First, data supplied from surface mines must be validated and normalized to common definitions and then analyzed to provide participating companies with regular reports that allow them to understand their position and resultant opportunities to achieve world-class performance. This model maintains granularity of the data for each operation that can then be recombined into standard comparisons or specific indices as required. The general categories of: operating delays, maintenance downtime, standby, and scheduled downtime, have been used to frame comparisons. Second, participating companies are looking to go behind the indices to identify and share best practices that distinguish particular operations. The spirit of cooperation between the companies involved in the pilot project is meant to be a model for future expansion of the benchmarking project.

Introduction

In today's global business world, being able to share information, stay abreast of new technologies and effectively focus research are capabilities critical to maintaining a competitive edge. That's the thinking behind SMART, an organization that provides an opportunity for surface mining companies to join forces and work together to meet common needs.

SMART is an association of surface mining companies who joined together in 1995 to develop a coordinated approach to meeting the needs of the industry. Collectively, our members have a wealth of knowledge and experience.

SMART has recognized the need for the establishment of a worldwide database that continuously collects mining equipment metrics related to productivity and cost. SMART has identified two key deliverables to ensure success of the project. First, data supplied from surface mines must be validated and normalized to common definitions and then analyzed to provide participating companies with regular reports that allow them to understand their position and resultant opportunities to achieve world-class performance. This model maintains granularity of the data for each operation that can then be recombined into standard comparisons or specific indices as required. The general categories of: operating delays, maintenance downtime, standby, and scheduled downtime, have been used to frame comparisons. Second, participating companies are looking to go behind the indices to identify and share best practices that distinguish particular operations.

While studies evaluating relative market or industry position have been conducted by a number of consulting agencies, the distinctive characteristic of the SMART benchmarking project is the collaborative spirit of the participating companies to use the data for more than just boardroom presentations. By letting the numbers point the direction, each company can select those areas where superior performance has been identified to discover the underlying best practices that make it possible. Participating companies can then, in turn, work together to share these same best practices.

The motivation is simple. Mining companies are in general selling into a commodities market where price is dictated. Controlling costs, therefore, is the only lever most companies have to increase profits and secure project longevity. Understanding what each company does well is a great starting point. Understanding how to do it better is the next step in winning the race. The spirit of cooperation between the companies involved in the pilot project is meant to be a model for future expansion of the benchmarking project.

Project History

Benchmarking has been an interest of the SMART organization for the last five years. Work by Blair Tuck (then a masters student at the University of Alberta) and Zoli Lukas provided a foundation both to understand the differences in collection and time allocation of equipment usage by mining companies and to standardize equipment utilization information.

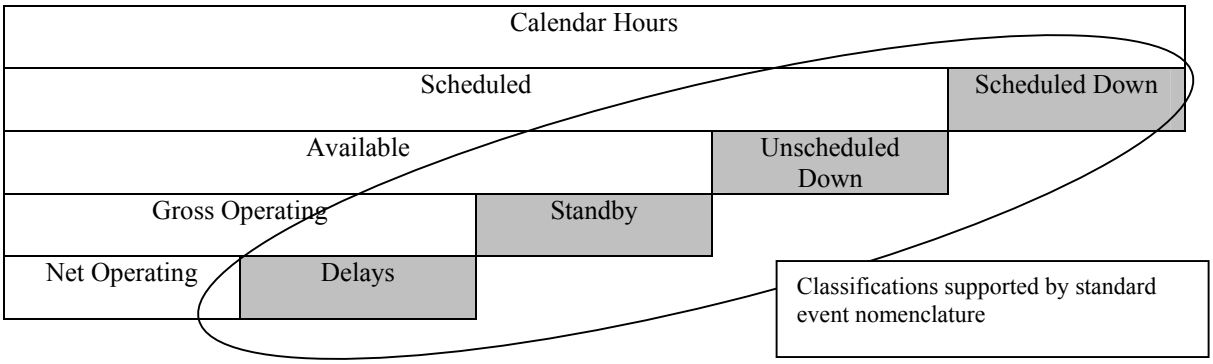
The current project is an extension of this work, putting the concepts into action. Previous attempts to benchmark mining companies have been inhibited by industry concerns about site-by-site comparability, confidentiality and project costs. To answer these criticisms, this project has been sponsored by SMART to ensure broad industry appeal. At the same time, the project has been initiated by three oil sands mining operations (Albian Sands Energy, Syncrude and Suncor) with similar mining environments and equipment to prove out data normalization and, more importantly, benchmarking value. Finally, should the pilot stage prove successful, a minimum of ten participating mining companies should provide sufficient data to remove easy identification of individual mines without consent. To support the initiative, Marston has been contracted to set up the database and reporting structure staged in three phases to match the benchmarking participating companies and data gathered.

Marston is a mine engineering and planning consulting firm with offices in the United States, Canada and Australia. Marston's current client list includes large oil sand producers, coal mines, metal mines and other mineral producers. This broad base of clients combined with a staff of engineers who have come up through operating sites helps to keep the focus of the benchmarking on the benefits for the operator. The company's past experience with benchmarking has helped to expose some of the common pitfalls involved with comparing different sites, and the SMART group presents a unique opportunity to work with a group committed to benchmarking and to realizing the benefits available through the comparison, evaluation, analysis and discussion of equipment data.

Data Model

To ensure comparability, data from each mine must be normalized. This begins with the simple categorization of 24 hours for each measured piece of mining equipment. The model maintains granularity of the data for each operation that can then be recombined into standard comparisons or specific indices as required. General categories of "operating delays", "maintenance downtime", "standby," and "scheduled downtime" have been used to frame comparisons.[1]

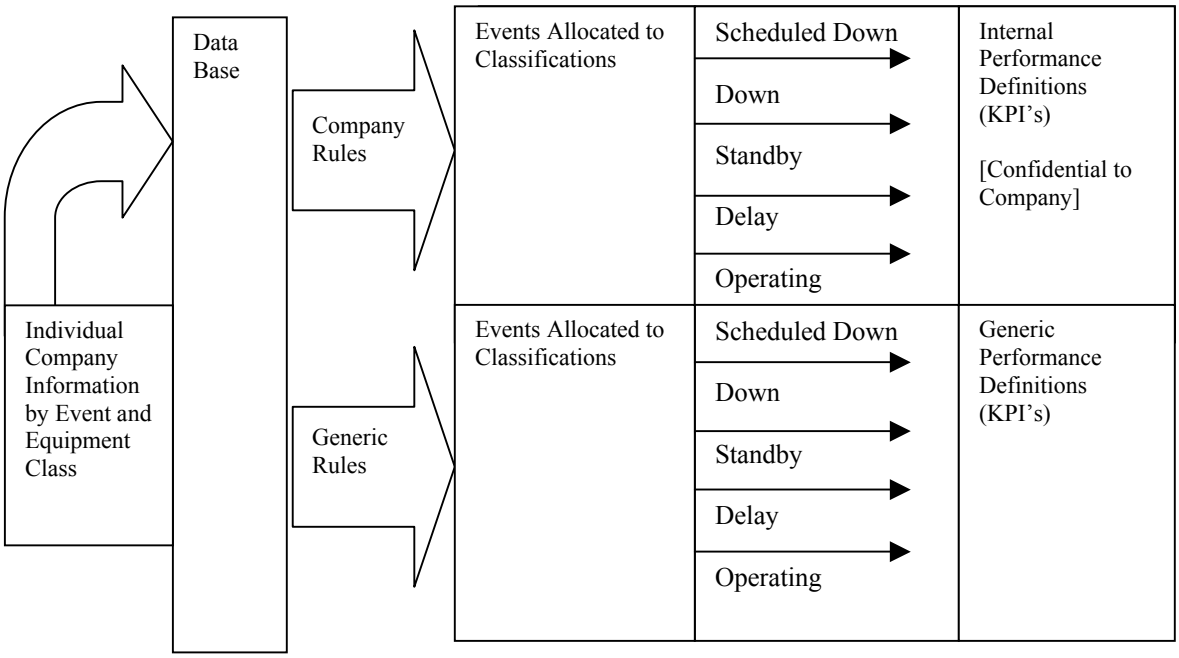
Time Classification Model:



Once all the calendar hours for identified equipment have been categorized according to accepted definitions, this data must be prepared for comparison in two formats. The first is that format specific to each company. This is necessary to confirm the validity of the submitted data. Second, a generic set of normalized Key Performance Indicators (KPI's) must be available to allow for cross company evaluation of equipment productivity. The data flow is show in the following diagram. Note that the each company's data remains confidential and representative to historical analysis. Similarly, the normalized data can be effectively compared with other mines without question of comparability.

[1] "Standardization of Definitions for Benchmarking of Availability and Utilization," June 2000 update to SMART from 1999 CIM presentation, Zoli Lukas.

Data Flow:



Data Collection:

To expand the initiative's level of detail and exposure beyond the existing parties, the requirement for a 3rd party with benchmarking experience and guiding principles was clearly established. The rules of engagement for the parties were defined as[2]:

1. Information will remain confidential to companies involved.
2. Disclosure of company identity will be open to participants.
3. Collaboration will be expected to share best practices as identified by reporting metrics.
4. No external use of shared information will be allowed without 100% agreement.
5. A 3rd party will manage the shared database.
6. Standard (agreed to) metrics will be used for comparison for all parties.
7. Each company will maintain independence for internal reporting.
8. Each company commits to provide timely consolidated information.

The data collection has been broken down into three major stages. The first involves the development of a working database, normalized data and a draft reporting format for the three operations involved in the pilot project. This work began in February with the partnering of SMART with Marston on this pilot project. Standards for data collection and normalization for the pilot have been completed and twelve months of data have been exchanged. While preliminary data is included in this paper, a final project summary will be presented at the CIM annual conference in Edmonton.

The second phase of the project involves an expansion of participating companies. Each new company will meet with Marston to establish data transfer protocol and definitions for data categorization and normalization – a process that normally takes one to two days. Once the data is collected, the new data will be included in existing reports. Marston, based on its experience and the input of participating companies will continue to upgrade and add reports as necessary.

[2] Modified from "Benchmarking at Phelps Dodge Mining Company."

The third and ongoing phase of the project is the further development of the data exchange interface. Analysis of underlying best practices will be provided via:

1. Direct contact between mines (each participant will be introduced via SMART or more informally through Marston).
2. Use of secure web based discussion groups including:
   - Online reports
   - Bulletin boards
   - Dedicated chat rooms
3. On-site investigations by Marston
4. Joint working sessions and/or conferences

This type of information sharing is growing in the maintenance side of the mining industry. The benchmarking data that this program will provide will allow expansion into a production arena while supporting the work that is already in progress.

General Performance Metrics:

For Phase I, the pilot project, the following general performance metrics along with the time based data have been selected for reporting:

Shovels (by class and make/model):

- tonnes/net operating hour (NOH)
- tonnes/gross operating hour (GOH)
- tonnes/unit/time period (e.g. month, quarter or year)
- Shovel efficiency (tonnes/shovel trucked hour) = tonnes/(NOH+Delays-wait on trucks)

Trucks (by class and make/model):

- Payload/unit
- Tonnes/unit/period
- Tonnes/NOH
- Tonnes/GOH
- Average one way haul distance
- Tonne-km/GOH
- Liters/GOH [future]
- Average loaded and empty speed [future]

Installed capacity:

- Shovels = total tonnes/ (Number of units x bucket size for each)
- Trucks = total tonnes/ (number of units x bed size for each)

For Phase II, benchmarking metrics will be expanded to cover a larger range of maintenance and organizational productivity metrics. Phase III will focus on expanding communication between participating mines, as well as explore the expansion of shared information to include cost information at varying levels of granularity.

Graphical Presentation:

The example figures shown in Figure 1, Sample of Productivity Plot and Figure 2, Sample Plot of Haul Truck Utilization are shown as the type of output that is currently being contemplated by SMART and Marston. The type of output, its method of distribution and other details will be worked out as the project progresses. Components of the program that will not change will be that the data will be accepted as provided with Marston supplying the normalization of data and confidentiality will be maintained.

As a plan for the future, Figure 3, Conceptual "SMART" e-report System Configuration shows the data flow and storage methodology that is being considered.

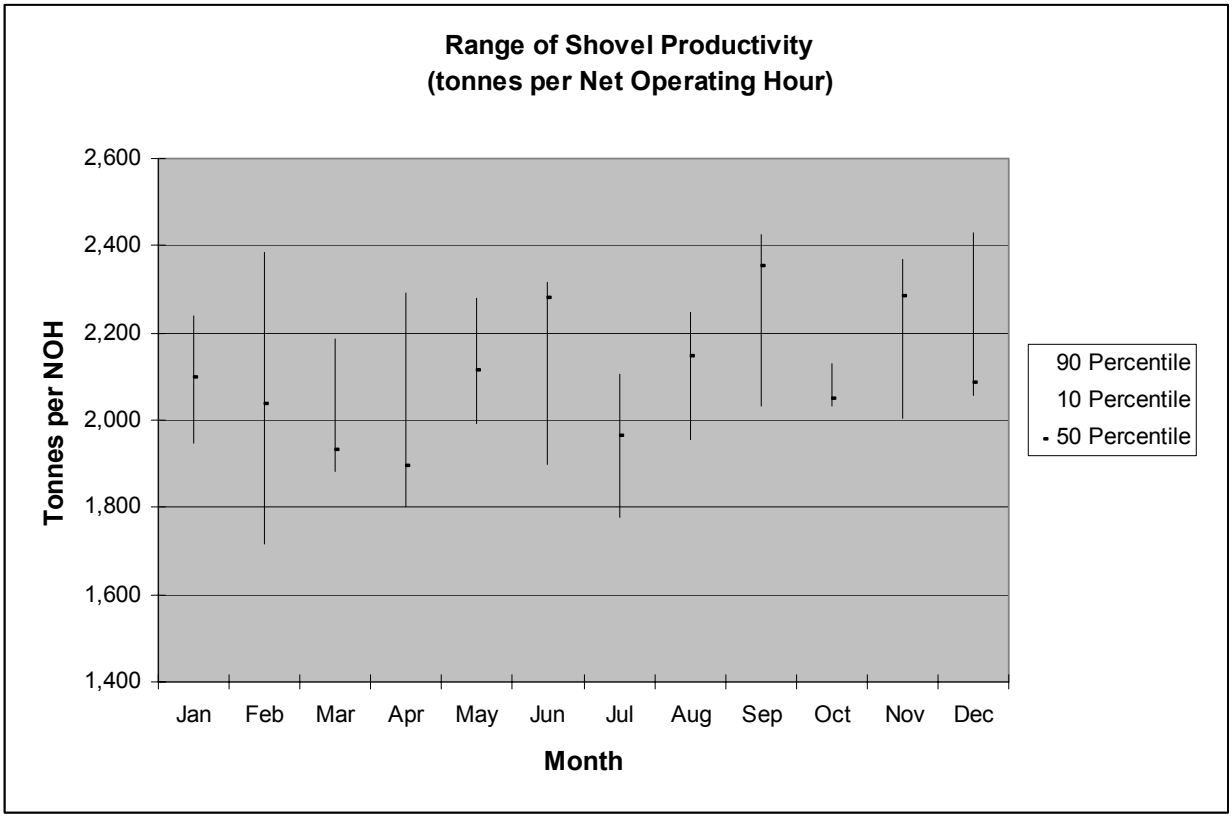


Figure 1
Sample of Productivity Plot

Program Costs and Benefits:

With basic definitions set for time allocation and normalization for each mine's environment and operating conditions, participation is easy and cost effective. With standard data exchange and reports, monthly or annual maintenance fees for reporting are very low. Since information is exchanged using each company's existing data systems, set up costs are also kept to a minimum. The only up front cost is the review of available data and definitions to set up a translation table and review normalization questions. With analysis left to individual companies to explore, the program can be tailor fit, preventing all participants from carrying development costs that they can't or won't use.

While the final pilot results won't be completed until May, numerous benefits are already becoming apparent. Clarity around definitions for time allocation has removed the majority of misconceptions about local productivity comparisons. Common equipment/manufacture problems have been identified, which have impacted equipment purchase decisions. Owners and management have expressed a growing confidence in each operator's ability to identify internal strengths and weaknesses. New measurement techniques for productivity analysis have been learned. Finally, the program has established a momentum for continuous improvement among the pilot project participants due to increased confidence in the benchmark numbers and newly opened doors of communication.

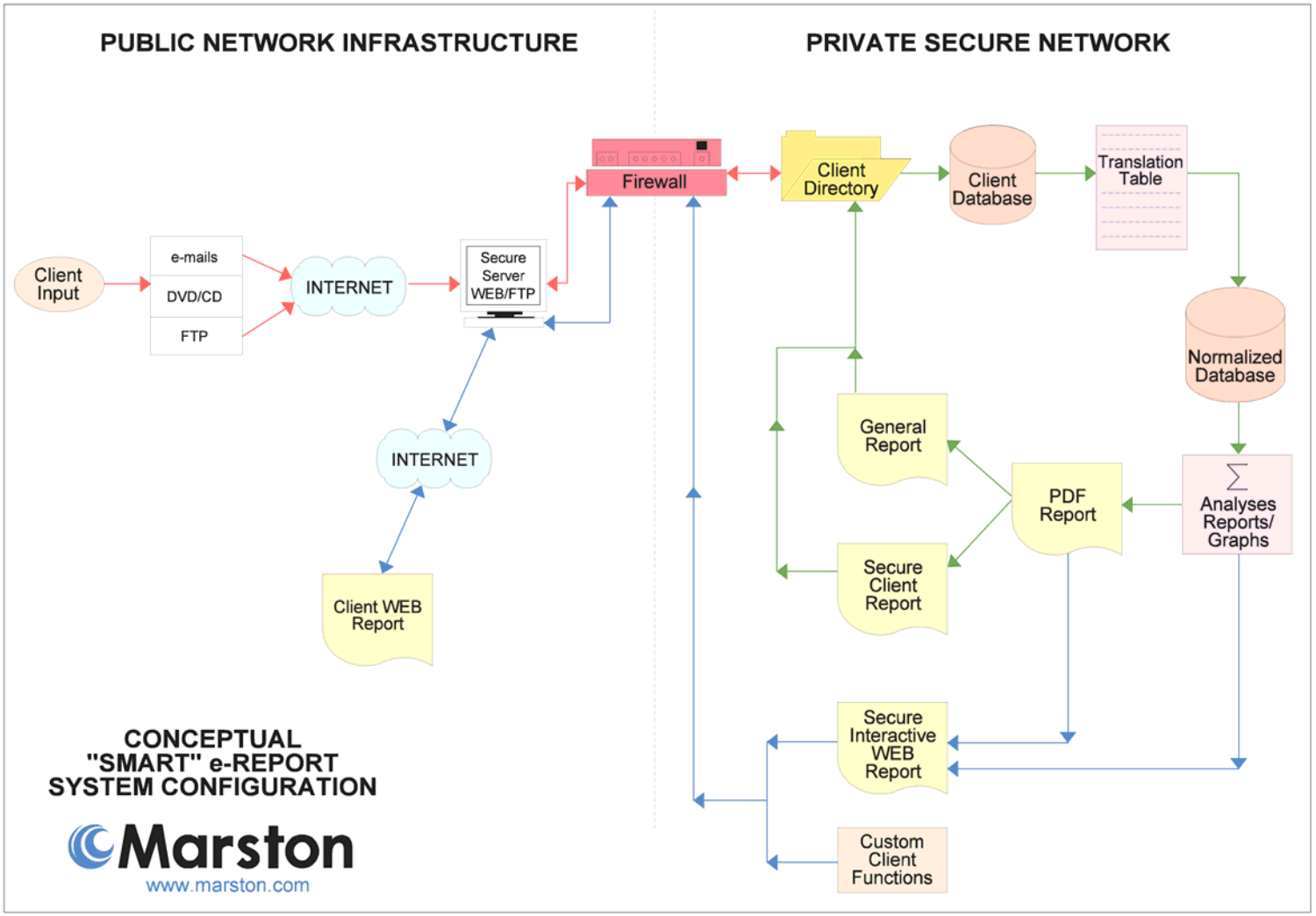


Figure 3
Conceptual "SMART" e-Report System Configuration

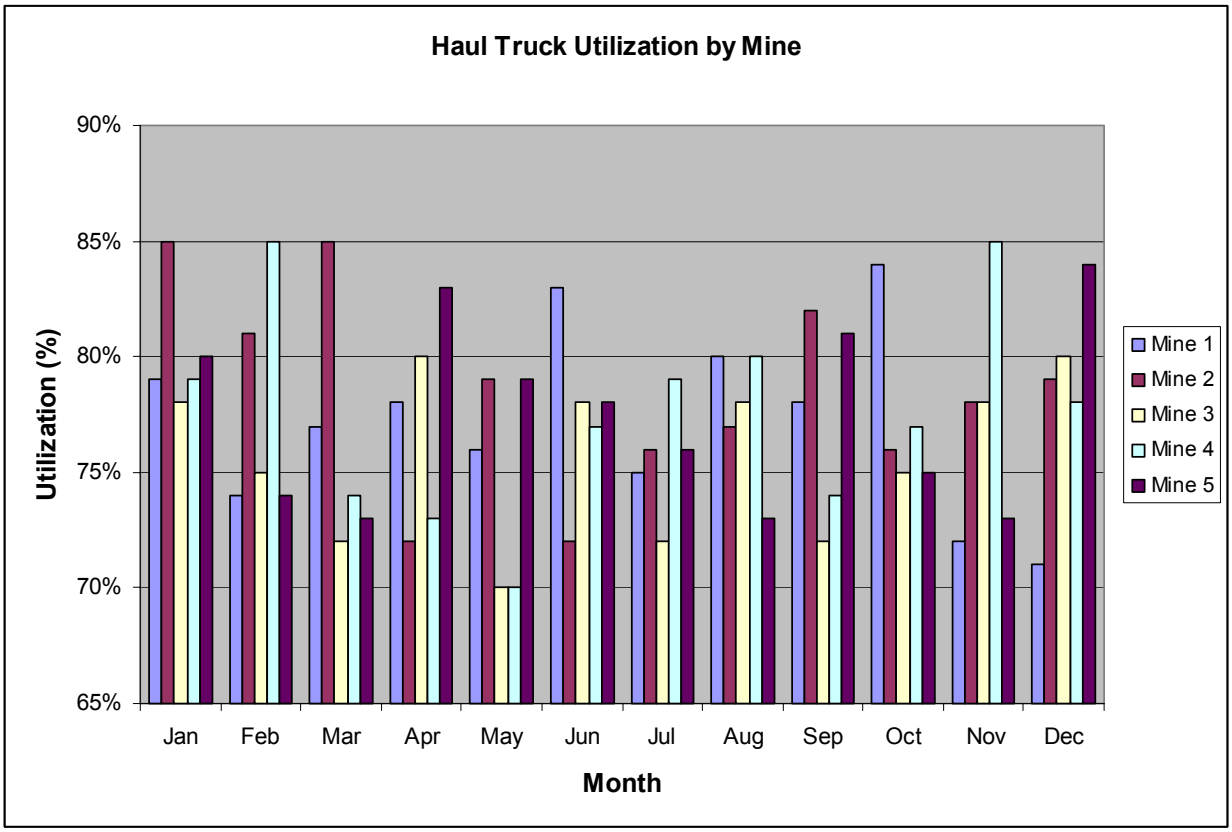


Figure 2
Sample Plot of Haul Truck Utilization

Conclusion

The driving motivation for the project was not statistics but continuous improvement. Continuous improvement starts with knowing how you are doing. While every operation takes care in measuring the utilization of its equipment, few mines can speak with confidence about how they are doing industry wide. Large petroleum, service and manufacturing companies have well publicized metrics for comparison, but measurements or standards for moving dirt are harder to come by.

SMART's initiative to establish a common industry measuring stick is the first step on the continuous improvement cycle. But another important step must be taken. Once the data is available, it must be evaluated and understood. Improving means understanding what actions, procedures or technology contributed to an outstanding result such that this can be duplicated across operations. It is these underlying best practices that must be fleshed out. As such, the sharing of statistical information is just he stepping stone for further analysis. Hence, a willingness to work together (i.e. allow for sharing of "how" results are being achieved at a particular mine) is fundamental to the project's success. The spirit of cooperation between the companies involved in the pilot project is meant to be a model for future expansion of the benchmarking project such that SMART's benchmarking project will become the pilot to the future.