TMS MES in a cement plant quarry

Description
In December 2014 TMS MES (Manufacturing Execution System) has been implemented into 19 machines of mobile equipment (including 14 site dumpers) in 2 crushing plants. Implementation comprised all quarry resources engaged in delivery of production material for cement plant.

TMS delivered: reporting software, system personalization, integration of the system with the plant fuel station, e-mail alarms system about exceeding speed and site dumpers overloading, dedicated reports individually configured and automatically sent by e-mail to mine foreman, mine manager and team responsible for production performance.

TMS reports has been unified with client’s SAP reporting standards.

Savings:
- **Fuel consumption** in l/ 100 km has been **reduced by 7%**.

![Fuel Consumption Graph](image)

**Monthly production rate has increased by 7% at the same time.**

Savings in fuel consumption has been reached through the following actions performed on the basis of the TMS system:

- Standstills of the site dumpers have been reduced
- Refuel procedure has been changes (to eliminate ques to the fuel station)
- Speeding has been eliminated (which improved safety)
- Overall output capacity of the mobile equipment has been increased
Site dumpers of increased fuel consumption have been identified and directed to the service inspection and repair.

More savings to be achieved:

- Savings in capital employed (1 site dumper was sold due to better utility of the remaining vehicles)
- Savings in labour (better time utilization by the drivers)
- Savings in repair and maintenance work.

**TMS benefits:**

- **Current control over achieving the production goals = optimal site dumpers utilization and allocation** through drives measuring per different unloading points
- **Bottlenecks monitoring** through the technological cycle time control divided into “packed” drive, “empty” drive, loading and unloading
- **Higher output capacity** due to monitoring and reduction of the output capacity fluctuation during one shift
- **Controlling the production discards** through comparing performed production with drives performed by the site dumpers.
- **Better costs control** through:
  - fuel consumption measurement for each machine,
  - eliminating the loss of fuel,
  - automatic KPI measurement in l/t
  - automatic OEE measurement
  - better drivers behaviour and habits
- **Better time utilization by giving up manual data processing in SAP system**
- **Eliminating the human errors in data collection and processing.**

**TMS MES methodology:**

Process of using dedicated TMS MES reports to improve plant’s performance is continuous.

- **Mine foreman:**
  - Controls the number of site dumpers unloading during a day by using the “Mine foreman report”
  - Directs the site dumpers to transport the cover after reaching daily production goal
  - Monitors utilization of site dumpers and crushers
• Mine manager:

  • Verifies drives’ efficiency by comparing the tonnage performed by the site dumpers with the daily production. Writes the results in “Manager report”.

Examples:

1. Mine foreman report – daily calculation of technological cycles divided into unloading points

Mine foreman monitors the number of cover drives performed by the site dumpers in a plant. After reaching daily production goal, directs the site dumpers to transport the cover.

Mine foreman’s report (drives)

2. Verification of site dumpers utilization – work time per categories

Mine foreman control the direct cost of drives and monitors work time of specified work categories.

Mine foreman’s report (times)

3. Verification of site dumpers utilization – loading the site dumpers and technological cycles frequency
With the aid of a diagram, mine foreman monitors the number of technological cycles and their frequency. He also controls site dumpers utilization and performs corrective actions, as necessary.

Mine foreman also controls time of each cycle. Thus, he can precisely verify a feasible unloading frequency.

4. **Manager’s report – comparing drives with production**

At the end of each shift, manager compares drives performed by the site dumpers with the production volume performed by the crushers. This way he verifies the site dumpers efficiency.
5. Verification of site dumpers condition – controlling the features of fuel consumption

Once a month chief engineer compares fuel consumption of all site dumpers. Owing to the fact, it is possible to identify immediately broken site dumpers and decide about the repair. The following example illustrates comparison of fuel consumption for 5 site dumpers. Curve showing the highest fuel consumption is coloured green.