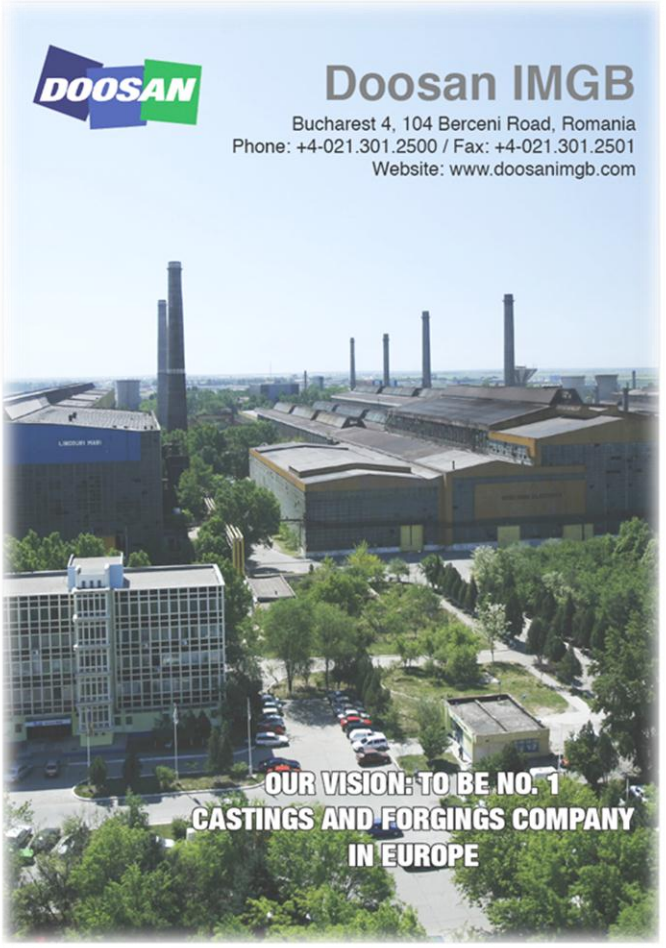

Doosan IMGB:
Energy Efficiency
- Results & Expectations

Energy Efficiency Forum
2015, October 08

DOOSAN

Motto

Energy Efficiency is the most effective way of Environmental Savings & on Sustainable Development.

Energy Efficiency

Content of Report

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Energy Efficiency Measures on the Technological Processes

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1. Energy Metering System
2. Power Factor Compensation
3. Rehabilitation of the Steam Plant
4. Environment. Fume Extraction Installation

Results. Conclusions. Expectations.

Energy Efficiency

General Measures on Energy Efficiency (NO & LOW Costs)

- **Implementation** of an **Energy Metering System:**
  - on line monitoring the electricity & natural gas consumption for the entire company, for each production shop and for the main consumers;
  - managing the energy consumptions for the company;
  - reporting the daily, weekly & monthly consumption of the electricity & natural gas to all interested about those information;
  - analyzing the consumptions in order to follow the consumption trend and to eliminate any non concordance between the technological processes and the energy consumptions;
  - creating a data base - visible on the entire company - able to offer a large pallet of opportunities in analyzing & prognosis the energy consumptions.

- **Metering, registering & reporting all the utility's consumptions (liquid gas, water etc.).**

- **Education on energy efficiency** based on periodically trainings about:
  - what means energy efficiency, how to eliminate the losses;
  - impact of any potential or implemented measure on energy efficiency;
  - news on legal and on technological field;
  - display in places visible, educational materials on energy efficiency and energy costs.

Energy Efficiency

General Measures on Energy Efficiency (NO & LOW Costs)

- Establish **clear targets for energy consumptions** (as KPI):
  - for the managers;
  - for the technological processes & for the main equipment.

- Apply any **measure in the "domestic" area:**
  - exploiting, as much is possible, the sunlight;
  - providing a selective lighting (general & local) in the production area;
  - installing motion sensors & twilight sensors in the artificial lighting;
  - changing, gradually, the classical lighting lamps with new ones, more performing by the energy point of view;
  - installing thermal sensors in the heating spaces;
  - using, in a proper way, the industrial waters.

- **Managing the supply & services contracts** on the utilities area:
  - following, continuously, the energy market (as prices tendencies & as legal provisions);
  - negotiating, continuously, properly supply contracts for utilities (as costs, payment conditions etc.);
  - keeping a continuously contact & dialogue with the utility's suppliers in order to identify & implement new measures on energy efficiency & cost savings.

Energy Efficiency

Energy Efficiency Measures on the Technological Processes

- **Rehabilitation of the Steelmaking Furnaces:**
  - **Administrative Measures:**
    - promoting an adequate exploit program;
    - planning & implementing fully working procedures;
    - planning & implementing the preventive maintenance; involving the exploit employees in checking the status of the equipment;
    - monitoring, registering & analyzing, continuously, the electricity consumptions.
  - **Technological Improvements:**
    - new control rooms for the electric arc furnaces;
    - new controlling system for the automatic movement of the electrodes;
    - technological improvements on the steel making process;
    - improve the quality of the scrap;
    - improvements on the cooling processes (clean, periodically, the water pipes, use a properly exploit regime for the pumping system, etc.).

Impact:

- ✓ decrease the electricity specific consumption per liquid steel ton from 1.9 MWh in 2005 to 1.2 MWh in 2014;
- ✓ increase the productivity & quality of the steel making process.

Energy Efficiency

Energy Efficiency Measures on the Technological Processes

- **Rehabilitation of the Forging & Treatment Furnaces:**
  - **Administrative Measures:**
    - promoting an adequate exploit program;
    - planning & implementing fully working procedures;
    - planning & implementing the preventive maintenance; involving the exploit employees in checking the status of the equipment;
    - monitoring, registering & analyzing, continuously, the natural gas consumptions.
  - **Technological Improvements:**
    - improvement of the performances of the 12,000 to ns press & manipulator;
    - improvement, continuously, the performances of the auxiliary services / utilities for the forging process (automation, emulsion station - pumps & engines, electricity supply, air compressed, water etc.);
    - automation & control of the burning process;
    - new insulating materials.

Impact:

- ✓ decrease the natural gas specific consumption per liquid steel ton from 1050 Nmc in 2005 to 350 Nmc in 2014;
- ✓ increase the productivity & quality of the forging process.

Energy Efficiency

Importance of Preventive Maintenance on Energy Efficiency

- **On the Technological Processes:**
  - continuously, planning & implementing a Preventive Maintenance Plan; do not disturb, the technological processes;
  - improving the quality of the repairing activities;
  - involving the exploit employees in the maintenance activities - based, especially on the **Checking Lists**;
  - create a critical stock for the “delicate” spare parts.
- **On the Utilities / Support Area:**
  - implementation of the newest methods on increasing the energy efficiency:
    - insulating the air compressed supply process;
    - promoting the variable speed equipment;
    - implementing the power factor correction.
  - modernizing (automation & control) & increasing the safety in supply for all the utilities (electricity, natural gas, liquid gas, fuel, air compressed, water, etc.);
  - checking, periodically, the supply lines (for utilities); eliminate any losses immediately.

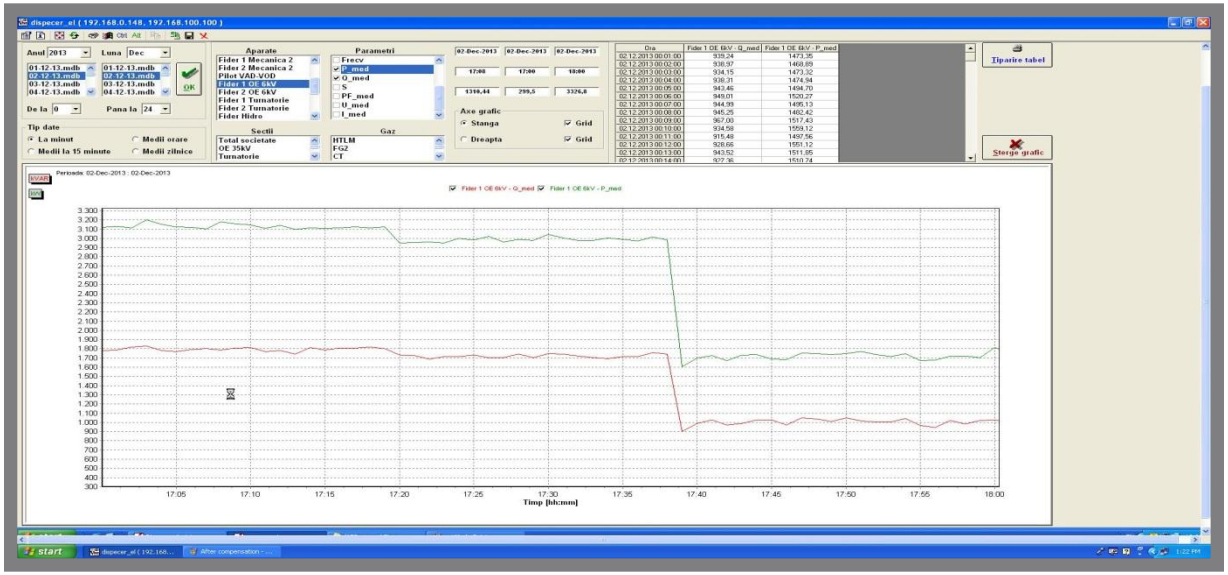
Impact:

- ✓ decrease the number of accidental stops at the technological equipment;
- ✓ increase the availability, also the performances of those equipment;
- ✓ increase the safety in supply for all the utilities (electricity, natural gas, liquid gas, fuel, air compressed, water, etc.).

Energy Efficiency

Energy Management. Energy Efficiency in Utilities Area

1. Energy Metering System



Impact:

✓ details on slide no. 3.

2. Power Factor Correction

Impact:

✓ decrease the cost with reactive power with around 80% on the 6 kV, in the last year; process is in progress.

Energy Efficiency

Energy Management. Energy Efficiency in Utilities Area

3. Rehabilitation of the Steam Plant

Impact:

- ✓ decrease the natural gas specific consumption with around 20%;
- ✓ increase the quality of the delivered technological steam;
- ✓ increase the safety of the steam supply process.

4. Environment. Fume Extraction Installation

Impact:

- ✓ decrease the emissions of the company;
- ✓ conform the company with the legal Romanian rules on environment.

Energy Efficiency

Results. Conclusions. Expectations.

- **Results:**
  - Decrease:
    - the electricity specific consumption per liquid steel ton from 1.9 MWh in 2005 to 1.2 MWh in 2014;
    - decrease the natural gas specific consumption per liquid steel ton from 1050 Nmc in 2005 to 350 Nmc in 2014;
    - the number of accidental stops at the technological equipment;
    - the cost with reactive power with around 80% on 6 kV, in the last year,
    - the CO2 emissions with around 50% on the last 10 years.
  - Increase:
    - the productivity & quality of the steel making process;
    - increase the productivity & quality of the forging process;
    - the availability, also the performances of those equipment;
    - the safety in supply for all the utilities.
  - Perform supply & service contracts for all the utilities.

Energy Efficiency

Results. Conclusions. Expectations.

- **Conclusions:**
  - Doosan IMGB S.A. acts and will act - always - on the direction of energy efficiency & on an environmental friendly relationship.
  - Doosan IMGB S.A. respects and will respect - always - all the legal provisions on the energy domain.

- **Expectations:**
  - New legal measures on the energy efficiency domain - Governmental Founds on Energy Efficiency (or other facilities).
  - “Pressure” generated by the regulated tariffs to be decreased.
  - To have, on the market, equilibrate prices for the energy and for our products. The increasing ratio for the electricity and for the natural gas is not in concordance with the evolution, on the market, for our products (decreasing continuously).