# Appendix 12. Steel industry

## Sector Specific Annex to Audit Guideline under the EE Incentive Scheme for energy intensive industries in Vietnam

# 1 Introduction

The purpose of this annex is to secure that the most important opportunities for energy efficiency improvements in the steel industry are investigated.

The annex is prepared to provide more sector-specific guidance than what is presented in the general energy audit guideline prepared under the Danish/Vietnamese cooperation.

As such, the guideline describes the most important focus areas within the key technologies of:

- **Preparation** is the process of preparation of the recycled items before melting. It is important to have a good filling of the furnace, and no items must prevent the lid from closing.

- **Transforming** is the transforming of the electricity to the voltage and frequency used in furnace. Transformation losses can be reduced significantly comparing old equipment with BAT.

- **Melting & casting** is the process of melting the scrap and iron, transport of the melt and casting of billets. Focusing on reducing idling is very important.

- **Rolling mill** is the process of shaping billets into finish profiles. Due to the high loads and temperatures that these applications handle, they are very energy intensive.

Auxiliary equipment:

- **Motors** are required for many applications in the steel industry like the rolling mill and general for pumps, fans etc.

- **Pumps** are required in hydraulic systems, water circulation, process air and gases.

- **Compressors** are required for pneumatics air supply, air separation processes, which use very large compressor motors.

- **Fans** are required for ventilation, extraction systems and material handling.

- **Water treatment** is required for reuse of water from cooling, descaling and dust scrubbing.

Below, important energy efficiency measures for each of these areas are described.

# 2 Technology review compared with Best Current Practice

In the table below, best practice energy efficiency projects are listed for each of the technologies above. The energy audit should consider the possible viability of each of the measures in the specific context.

The energy audit report should document how these potential measures have been considered. For each measure it should be stated whether it is practically relevant for the specific enterprise. If it could be relevant, the report must make a pre-assessment of the technical and financial viability.

| No. | Technology | Energy efficiency measures |
|---|---|---|
| 1 | Preparation | • Are scrap items prepared for an efficient melting process by cutting into pieces?<br>• Can a shredder be used to minimize the size of raw materials so as a smooth and efficient feeding of furnaces is achieved? |
| 2 | Transforming | • Are transformer losses higher than BAT? |
| 3 | Melting & casting | • Are the melting furnaces operated with electricity consumption similar to international benchmarks?<br>• Can the power unit perform an uninterrupted melting procedure and a precise temperature control for holding? |

| No. | Technology | Energy efficiency measures |
|---|---|---|
| | | • Can the melting control system manage preheating, sintering, melting, and holding in an energy efficient way?<br>• Is the furnace and lid construction well insulated?<br>• Is idle time and alloy shifting reduced as much as possible?<br>• Are hydraulic support systems operated efficiently during on-loaded periods and when idling? |
| 4 | Pressure Recovery Turbine | • Pressure Recovery Turbine for Power Generation at the Top of the Blast Furnace<br>• Can a turbine be used in the blast furnace of a steel factory, with the function of controlling pressure at the top of the blast furnace and also generating electricity by rotating the turbine with blast furnace gas generated at the furnace? |
| 5 | Rolling mill | • The rolling steel reheating furnace can be electric or with combustion and batch or continuous. In all cases is the question; is the total efficiency high?<br>- Efficient energy transformation.<br>- Radiation losses.<br>- Losses due to openings.<br>• Are roller and roller table motors highly efficient and with optimized drives?<br>• Are hydraulic support systems operated efficiently during on-loaded periods and when idling? – can DC-motors be applied? |

| No. | Technology | Energy efficiency measures |
|---|---|---|
| | | • Are VSD's and the control system capable of handling quickly changing loads and wide torque ranges in an energy efficient way?<br>• W.A.G.E.S. (water, air, gases, electricity, steam) utilities represent a large share of energy consumption.<br>- Is the cooling water system efficient? Can the water reuse be increased?<br>- Are the descaling pumps and water circulation pumps efficient?<br>- Are furnace combustion and fume extraction fans efficient? |
| 6 | Auxiliary equipment | • Are VSD's used where relevant?<br>• Is motor efficiency similar to IE4 or IE5 requirements?<br>• Are pumps and fans designed for the actual working conditions and is the total pump / fan efficiency high?<br>• Are compressor systems designed to be energy efficient in the actual working range? |
| 7 | Heat recovery | • Heat can be recovered from furnaces, exhaust air, hydraulic systems, cooling water. With very high temperatures the potential for heat recovery is large, but the challenge is to find good usage.<br>- Assessment of internal possibilities.<br>- Assessment of possible export to neighboring enterprises. |

| No. | Technology | Energy efficiency measures |
|---|---|---|
| 8 | Water reuse | • Increasing water reuse will also have an impact on the energy consumption. Is a high percentage of the water cleaned, cooled, and returned to the source?<br>• Are the water flows controlled according to the actual need?<br>• Is unnecessary pumping prevented? |