

Appendix 8. Mechanical 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 mechanics 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:

- **Heating** is the process of heating the billets before cutting to soften them, after cutting for incubation and after machining for hardening. Focusing idling and heat losses is very important.
- **Cutting, forging, and machining** is the process of cutting rebar into billets, shaping the billets into bearings and subsequent machining and polishing. The focus should be on efficiency of motors.
- **Painting and galvanizing** are the surface treatment of the product to create an anti-rust coating by dipping it into a molten zinc solution.
- **Transforming** is the transforming of the electricity to the voltage and frequency used in furnace. Transformation losses can be reduced significantly when comparing old equipment with BAT.

Auxiliary equipment:

- **Motors** are required for many applications in the mechanics 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	Heating	<ul style="list-style-type: none"> • The billet furnace can be heated by electricity or fuel; and it can be operated batch wise or continuously. The main energy losses to consider are: <ul style="list-style-type: none"> - Electricity transformation losses. - Radiation losses. - Losses due to openings. • Is the furnace and lid construction well insulated? • Is idle time and alloy shifting reduced as much as possible?

No.	Technology	Energy efficiency measures
		<ul style="list-style-type: none"> • Is the heat from the exhaust gasses reused? • Is the furnace combustion process optimized with the correct excess air ratio?
2	Cutting, forging, and machining	<ul style="list-style-type: none"> • Are motors highly efficient and with optimized drives? • Are VSD's and the control system capable of handling quickly changing loads and wide torque ranges in an energy efficient way? • W.A.G.E.S. (water, air, gases, electricity, steam) utilities represent a large share of energy consumption. <ul style="list-style-type: none"> - Is the cooling water system efficient? Can the water reuse be increased? - Are the descaling pumps and water circulation pumps efficient? - Are furnace combustion and fume extraction fans efficient?
3	Painting and galvanizing	<ul style="list-style-type: none"> • Is the temperature of the zinc bath controlled to minimize energy consumption and heat loss? • Is idle time reduced as much as possible? • Are zinc elements to zinc bath sized for an efficient melting process?
4	Transforming	<ul style="list-style-type: none"> • Are transformer losses higher than BAT?
5	Auxiliary equipment	<ul style="list-style-type: none"> • Are VSD's used where relevant? • Is motor efficiency similar to IE4 or IE5 requirements?

No.	Technology	Energy efficiency measures
		<ul style="list-style-type: none"> • Are pumps and fans designed for the actual working conditions and is the total pump / fan efficiency high? • Are hydraulic systems designed to minimize losses during idle operation? • Are compressor systems designed to be energy efficient in the actual working range?
6	Heat recovery	<ul style="list-style-type: none"> • Heat can be recovered from furnaces, exhaust air, hydraulic systems, compressed air, cooling water, and generators. With very high temperatures the potential for heat recovery is large, but the challenge is to find good usage. <ul style="list-style-type: none"> - Assessment of internal possibilities. - Assessment of possible export to neighboring enterprises.
7	Water reuse	<ul style="list-style-type: none"> • Increasing water reuse will also have an impact on energy consumption. Is a high percentage of the water cleaned, cooled, and returned to the source? • Are the water flows controlled according to the actual need? • Is unnecessary pumping prevented?