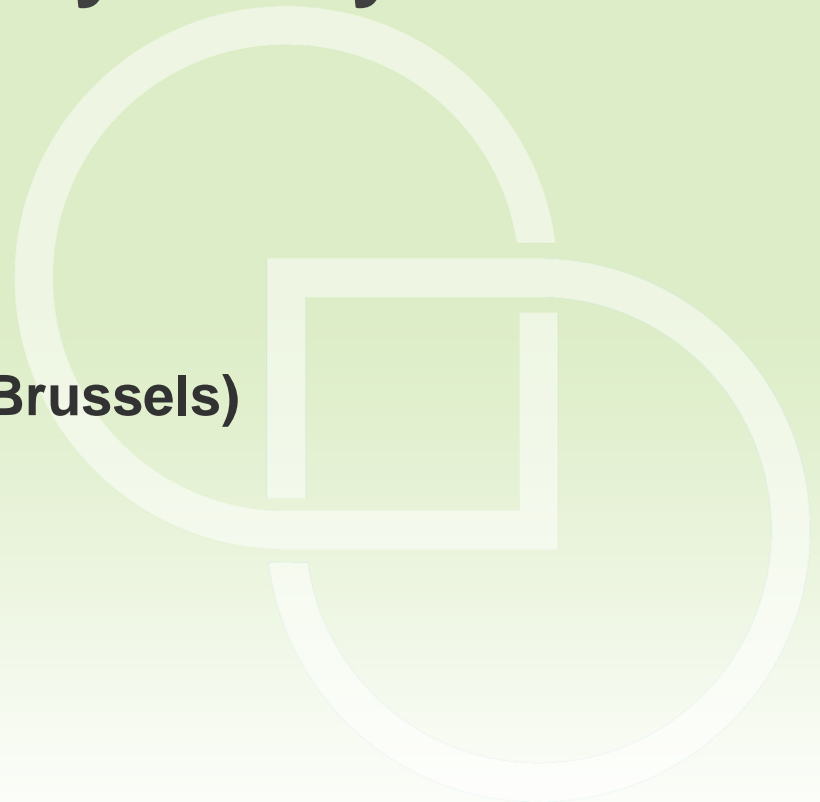


Motors and the Ecodesign Directive Machine Tool Preparatory Study

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The Challenge of Regulating Machine Tools

Around 90% of the energy consumed by machine tools is used by motors, with most machine tools comprising an assembly of several motors.

What is the best basis for regulation?

This presentation looks at the complexities of regulating machine tools, and in particular considers the pros and cons of regulating either the whole machine, or the sub components on which it is based.

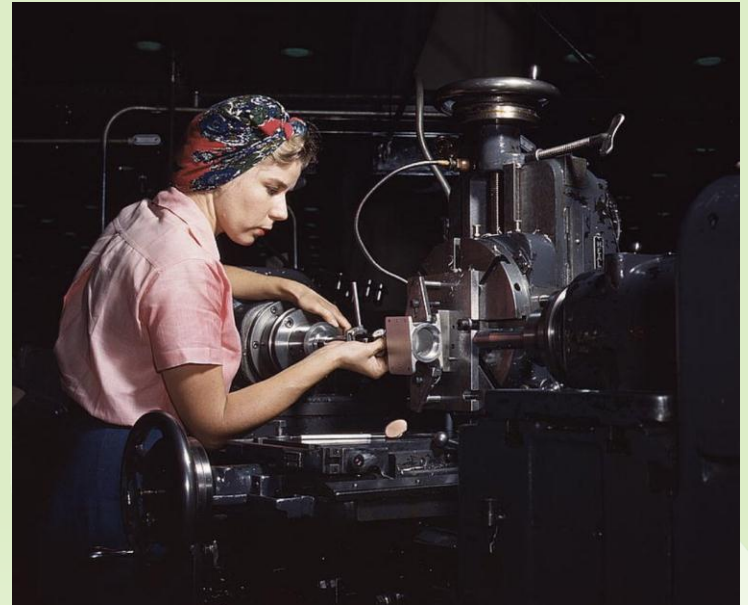


The World of Machine Tools

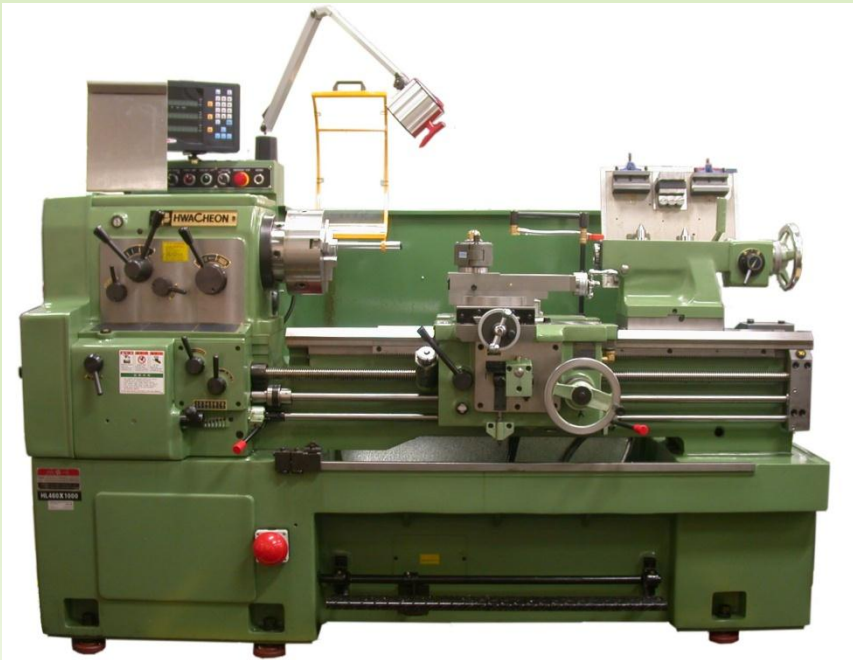
There is more than one way to classify machine tools:

- By Type of machine
- By Process
- By Level of automation
- +

It is thought that beyond simple machinery, the variation in product is so huge that setting regulations that are fair to all products will be difficult.



The Variety of Machine Tools - Lathes



Machine Tools – a Miscellany



Classification by Process and Type of Machine

DIN 69651 Shows metalworking as a sub-category of “Manufacturing”

- Primary shaping
- Forming
- Separating
- Joining
- Coating
- Enhancing material properties



Milling, drilling, turning, pressing, grinding, cutting, sawing, bending



Punching, pressing, sawing, laser cutting, plasma cutting or oxy-acetylene cutting.

Why Secondary Performance parameters matter

Variations in duty mean that comparing different machines can be practically impossible:

- Finish
- Tolerance
- Temperature
- Material efficiency
- Multi-purpose machines
- Flexibility
- Total costs of ownership



Specific Energy Consumption (SEC)

The SEC assesses the energy needed to do a job. This works fine for a given product, but is weak when there is any product variation. Many research papers use this method.

Making bottles – *A not so simple example.*

- Bigger bottles require more energy, and so should the measure of throughput be units or weight?
- How should the different bottle thickness be taken account of?
- Similar but different products can require more or less energy: how could a minimum performance requirement take this into account?
- How should changes in quantities of bottles produced alter the energy use per product?



The Sub-assembly approach

Key components include:

- Drive motors
- Servo positioning motors
- Lubricant pumps
- Controls
- Hydraulic power packs

Focusing on these removes the need for worrying about machine classification. It also avoids the need to define standard test pieces for different machine categories and sizes.

BUT it ignores the opportunities from better controls and energy relevant parts.

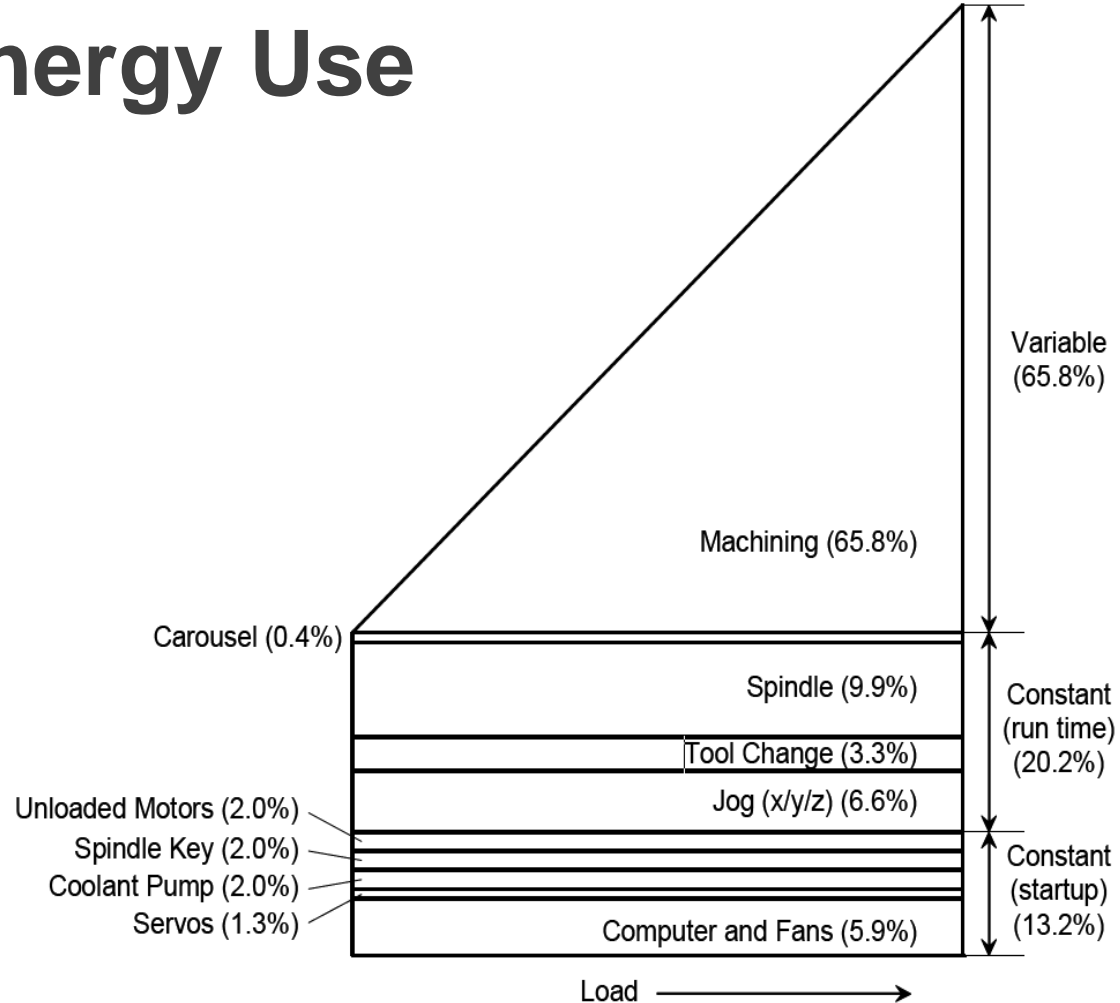


Machine Tool Energy Use

Actual machining (cutting) energy typically averages just 15% of the total, the remainder is due to overhead energy and running at low load.

The correct sizing of equipment is an issue for the User, not the regulator.

Overhead consumption is directly targeted by specific energy consumption, but not if only looking at sub-components.



Constant and variable energy use of a machine tool (Kordonowy)

Alignment with Motor regulations

What if the Ecodesign Machine Tool study defines standards for other motors and VSDs before the next Ecodesign motor regulations are ready?



Summary

Machine Tools are complex

Looking at the whole machine captures all aspects of operation, but given the complexity of the market is it just too ambitious? Or should we settle for a simpler, but potentially less encompassing approach, that focuses on the sub-components?



Over to you.....

Is there any regulatory work going on elsewhere that we're not aware of?

Are there any important technical aspects that have been overlooked?

How do you think machine tools should be regulated?

For the latest information on the Ecodesign Preparatory Study, visit <http://www.ecomachinetools.eu>