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Energy Efficiency - Made in Germany

Ways to energy efficiency for the metall and paper industry

23.11.2010
Export Initiative Energy Efficiency

Dr. Kathrin Hesse
Fraunhofer Institute for Material Flow and Logistics

on behalf of the German Federal Ministry of Economics and Technology

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Contents

- Demand for energy in the industry
- Cleaner Production –
  a strategy for efficiency?
- Supply engineering –
  measures for energy efficiency

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Demand for Energy in the industry

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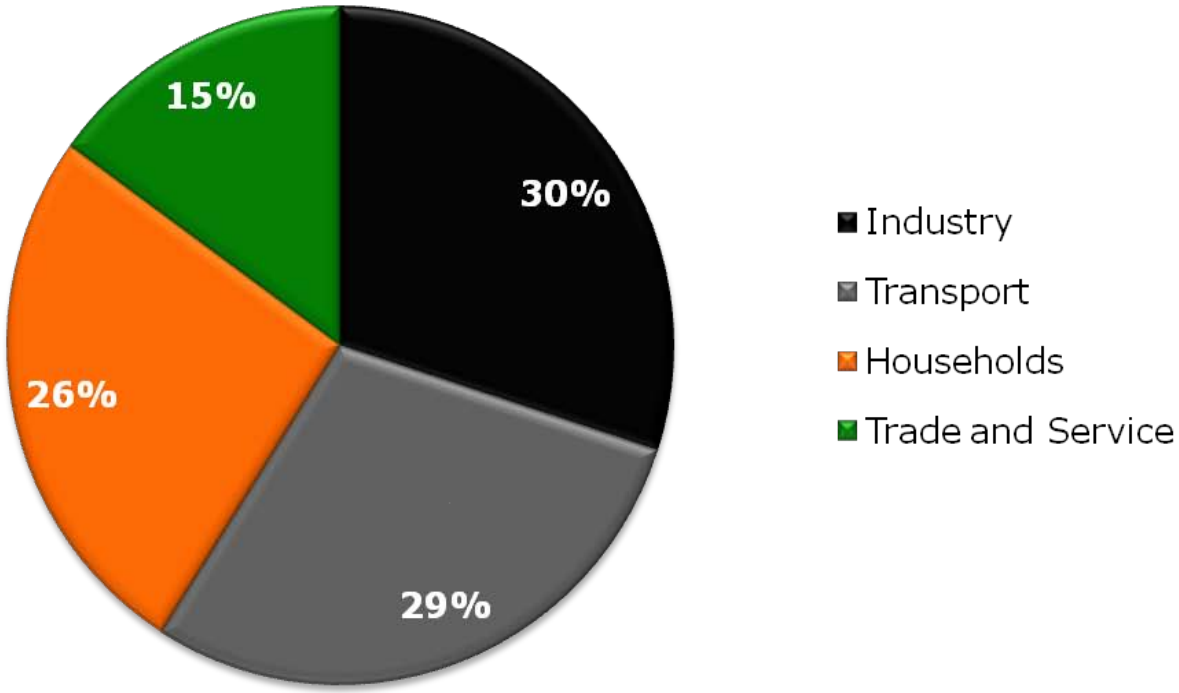
Energy Demand in German Economic Sectors
Distribution of Final Energy Consumption (2007)



Source: Arbeitsgemeinschaft Energiebilanzen, Stand April 2010

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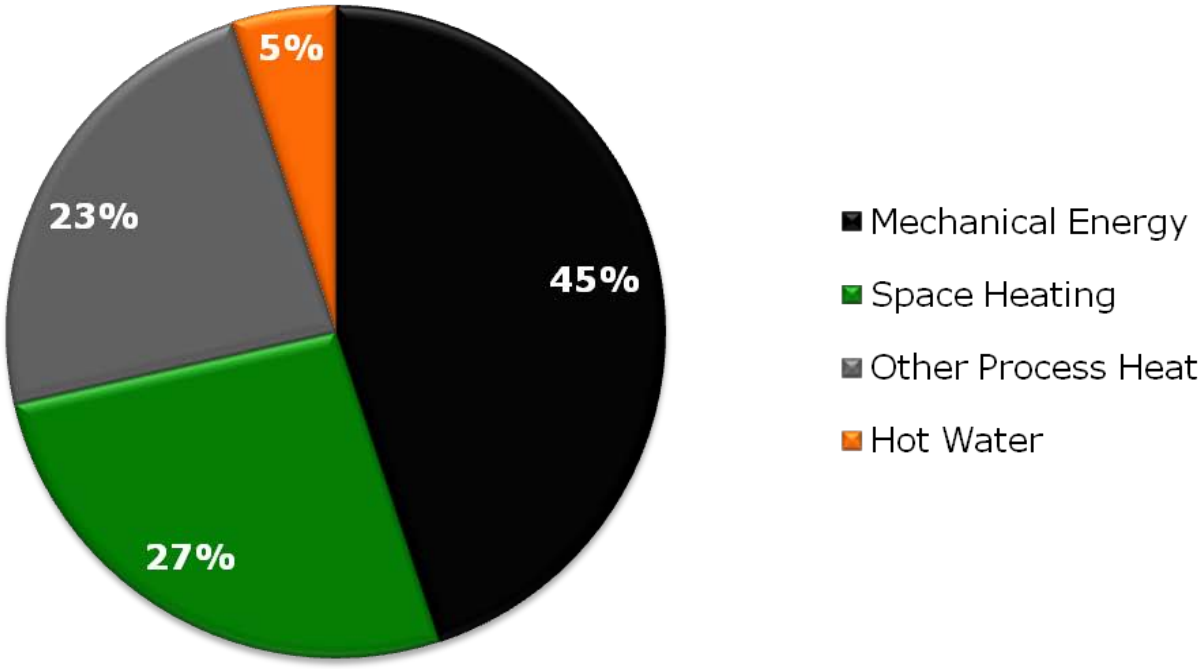
Energy Demand in the German Industry (2007)
Final Energy Consumption for Industrial Applications



Source: Arbeitsgemeinschaft Energiebilanzen, Stand April 2010

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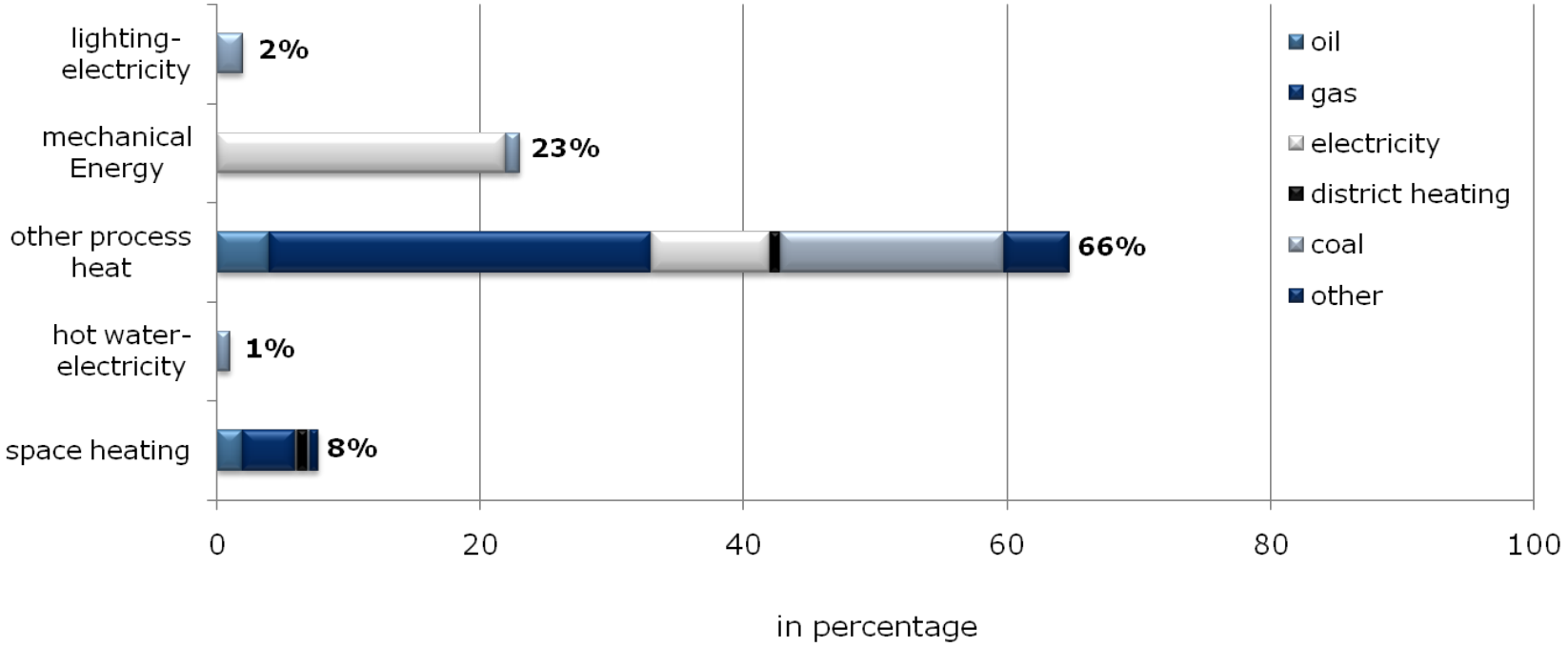
Energy Demand in the German Industry (2007)
Energy Sources by Fields of Application



Source: Arbeitsgemeinschaft Energiebilanzen, Stand April 2010

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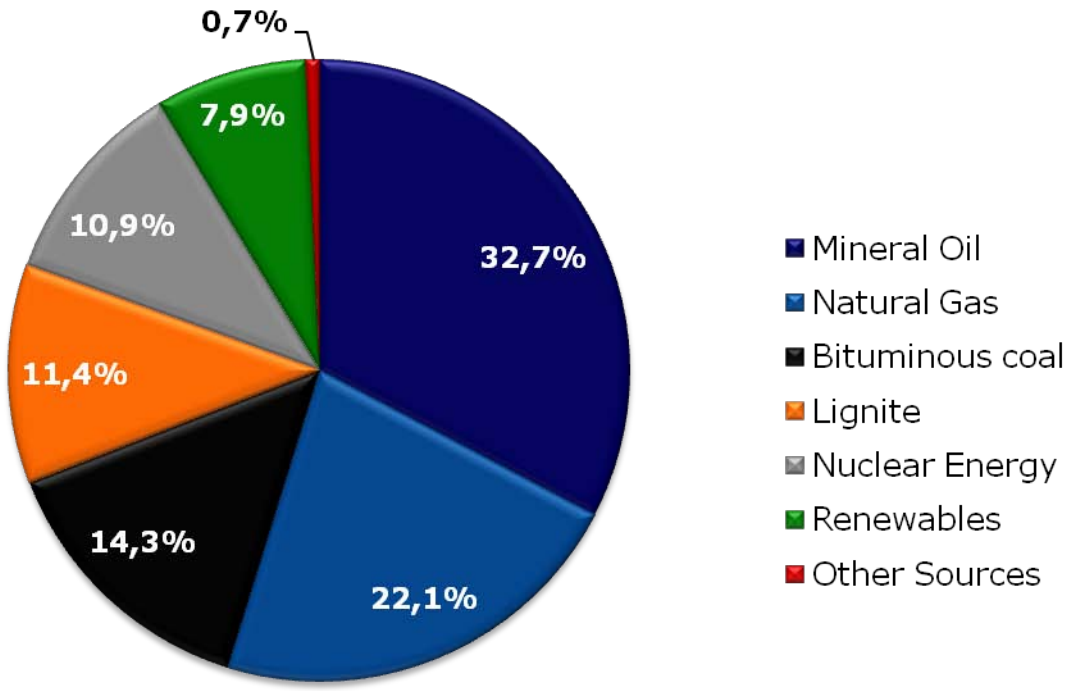
Primary Energy Consumption in Germany by Fuel Sources (2007)



Source: AG Energiebilanzen, Auswertungstabellen zur Energiebilanz Deutschland 2010

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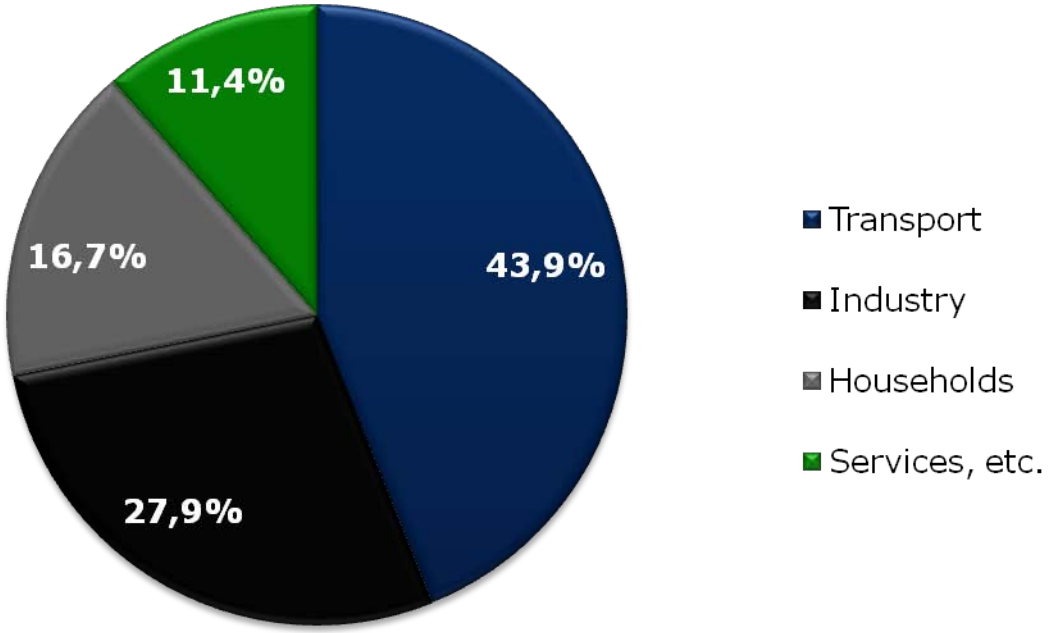
Spain - Final Energy Consumption by sector (2007)



Source: Source: Eurostat , May 2009

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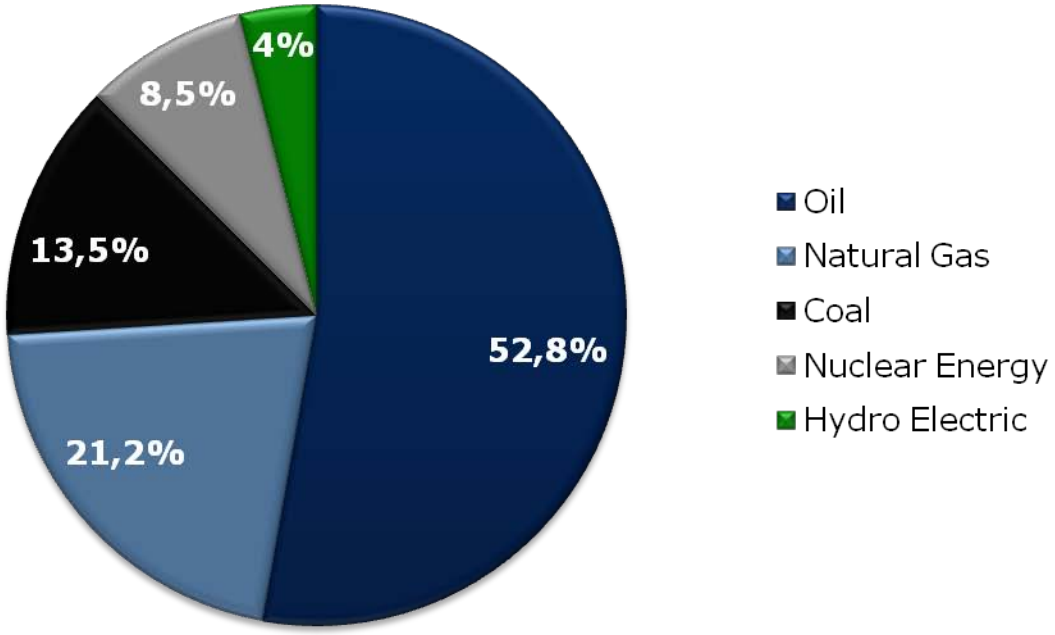
Primary Energy Consumption in Spain by Fuel Sources (2007)



Source: BP Statistical Review of World Energy, 2009

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German metal industry – key facts

- Initial situation
  - Energy costs in the metal industry are in the order of about 0.3% to 6% of the annual turnover
- Processes
  - Large range of processing methods and their combinations
  - Wide spectrum of various companies regarding processing steps, manufacturing facilities, production types, degree of mechanization
- Strategy for increasing energy efficiency
  - Reduction of energy demand
  - Optimization of energy application

Source: energieagentur.nrw

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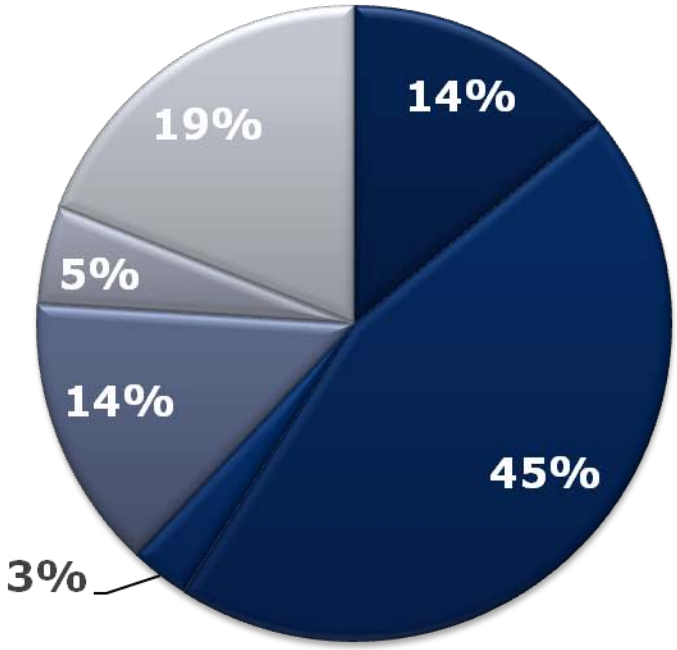
Energy expenditure in the German metal industry (2008)



Source: Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Monitoringbericht 2008

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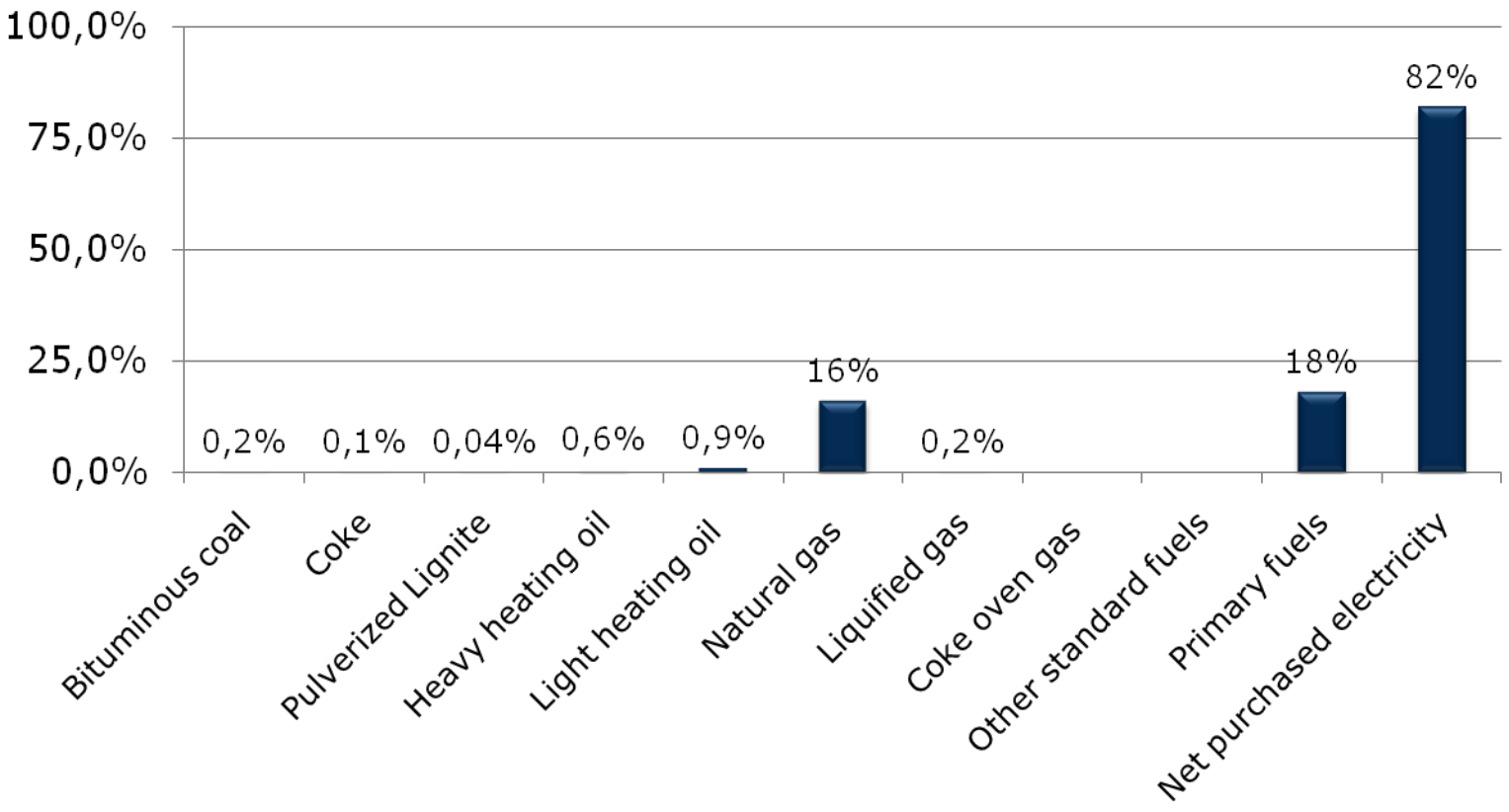
Energy expenditure in the German non-ferrous metal industry (2008)



Source: Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Monitoringbericht 2008

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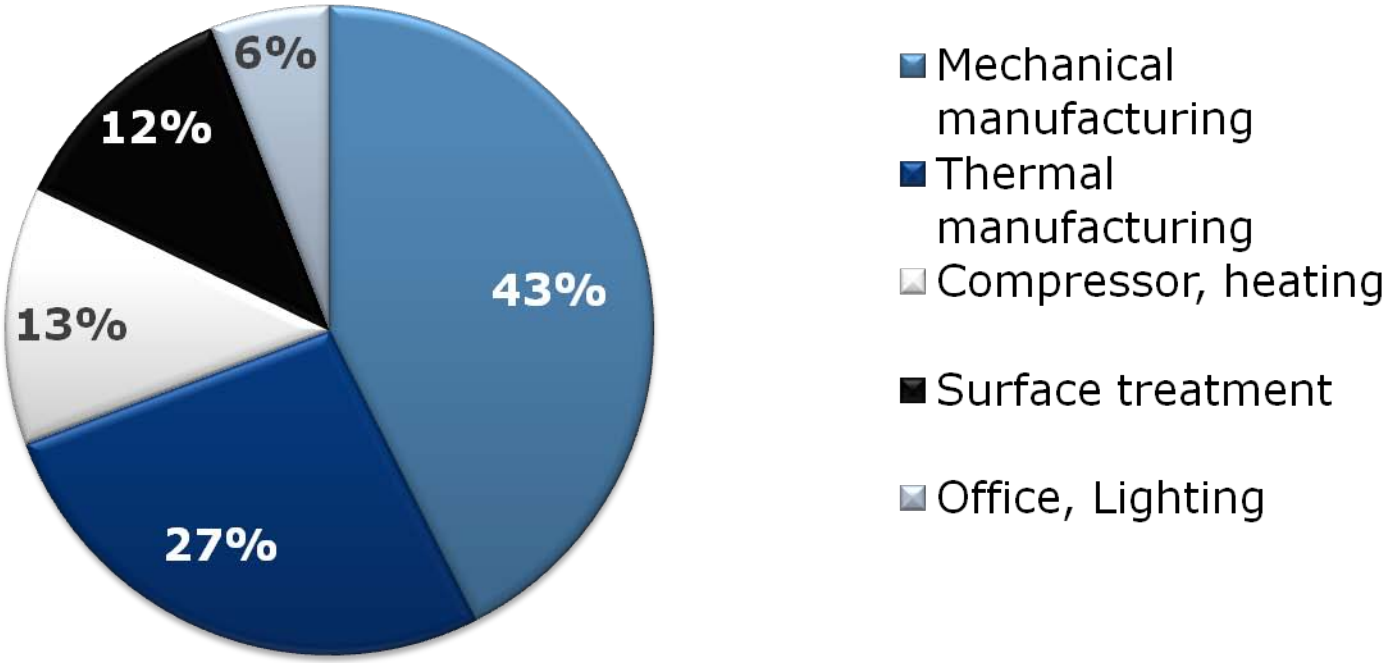
Electricity demand in the German metal industry for selected processes



Source: energieagentur.nrw

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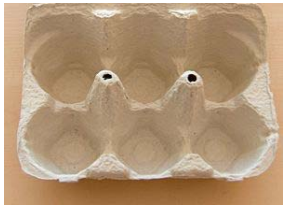
German Pulp and Paper Industry – key facts

- Initial situation
  - The pulp and paper industry belongs to Germany's fifth largest industrial energy consumers
  - During the last years the share of energy costs relating to the turnover was approx. 10%

- Processes
  - Half-stock production
    (pulp, mechanical pulp or recycled fiber)
  - Stock preparation
  - Paper machine (Fourdrinier machine)
  - Finishing

- Strategy for increasing energy efficiency
  - Reduction of energy demand
  - Optimization of energy application



Source: energieagentur.nrw

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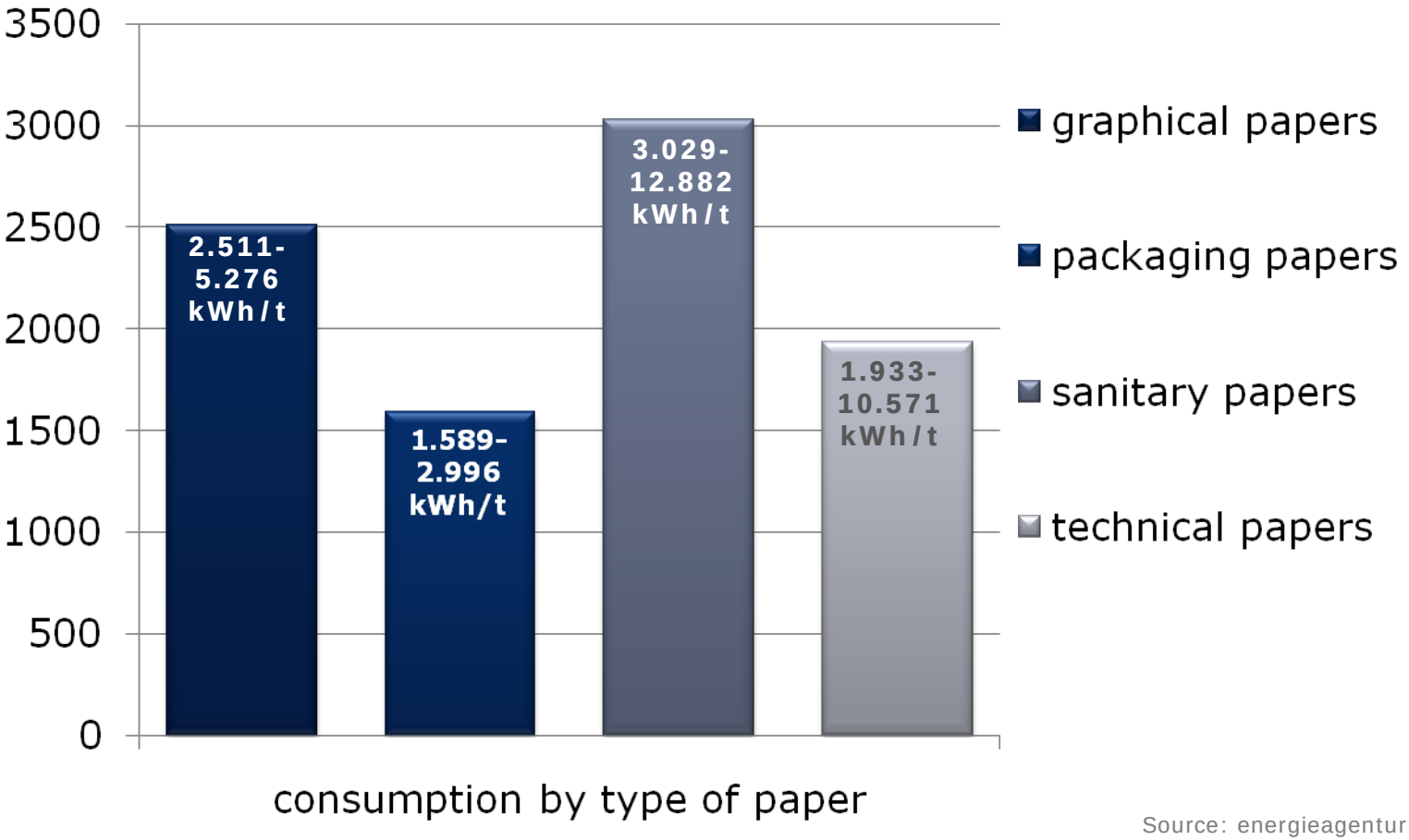
Energy consumption in the German paper industry for different paper products



Source: energieagentur.nrw

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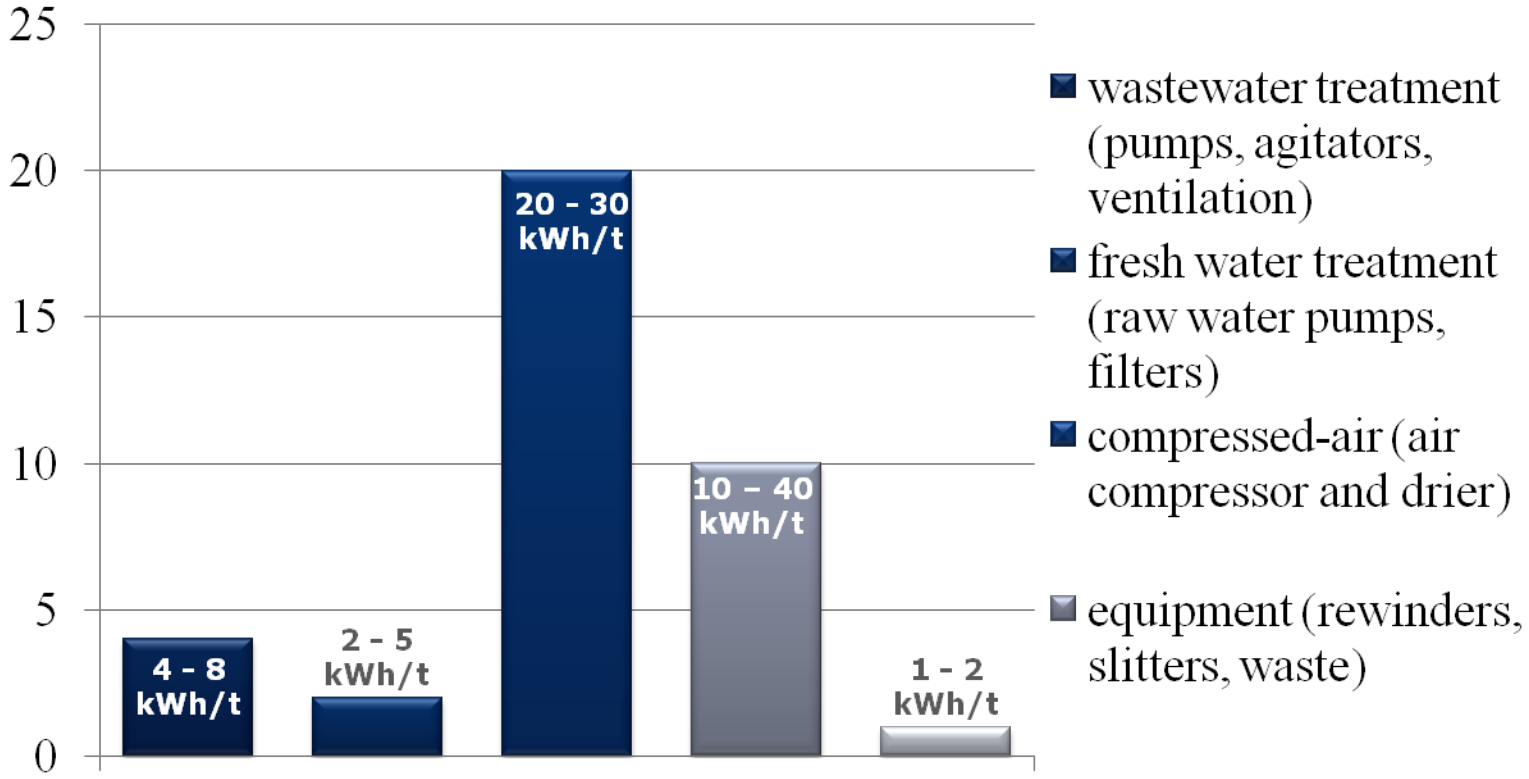
Energy consumption in the German paper industry for supply engineering



Source: energieagentur.nrw

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Cleaner Production – a strategy for efficiency?

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Energy Efficiency by Cleaner Production

- Objective
  - Prevention or reduction of harmful environmental impacts by choice and optimization of a suitable production method
- Ecological AND economical benefits
  - Improvement of process flows
  - Optimization of the use of resources
  - Improvement of the emission situation
  - Reduction of production costs
  - Decreasing the quantities of waste and wastewater
- Proceeding
  - Coarse analysis = assessment of the actual state
  - Macro analysis = identification of potentials for improvement
  - Micro analysis = preparation of cleaner production measures

Source: Fraunhofer IML

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Cleaner Production in Electroplating Industry

- Initial situation
  - High water and energy consumptions for realizing optimum surfaces
- Proceeding
  - Examination of all relevant material flows and processes in a electroplating plant
- Results
  - Reduction of surface losses of the heating boilers by the installation of heat exchangers (reduction of energy use by 10%)
  - Optimization of a production line by improved process organization in the procedure of rinsing water (reduction of water and chemical use by 20%)
  - Reduction of the fresh water supply by rain water exploitation (coverage of fresh water share up to 80% by rain water)

Source: Fraunhofer IML

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supply engineering – measures for energy efficiency

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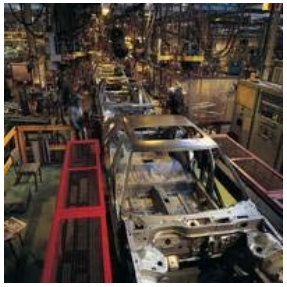
Measures in the field of Supply Engineering I

- Lighting
  - Raise of the lights degree of effectiveness
  - Change of the geometric arrangement in the room
  - Adjustment of the lighting intensity and duration
- Compressed air
  - Check and removal of leakages
  - Optimal sizing of the compressors and pipes
  - Adapted processing of the compressed air
- Ventilation plants
  - Orientation towards actual requirements
  - Accomplishment of the plants
  - Geometric arrangement of airflow



Source: Deutsche Energieagentur dena

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Measures in the field of Supply Engineering II

- Cooling systems and air condition plants
  - Check of the required temperature level
  - Generation of process cooling with cooling towers or groundwater
  - Elimination of heat sources from air-conditioned areas

- Heating systems and thermal insulation
  - Measures for the heat recovery
  - Automatic regulation of heaters
  - Insulation of plants and buildings

- Electric motor
  - Choice of engines of a higher efficiency class
  - Use of speed regulated drives

Source: Deutsche Energieagentur dena

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Technology: lighting in a production hall

- Initial situation
  - Lights with white-coated trapezoid metal reflectors
  - Equipped with T8 lamps, 58W and conventional electrical ballast
- Energy efficiency measures
  - Lights with highly efficient reflectors
  - Daylight dependent lighting regulation
  - Replacement of conventional electrical ballast (KVG) by electronic (EVG)
- Saving potential
  - Energy: 970.000 kWh/a (72%)
  - Costs: 99274 USD
  - Invest: 180731 USD

Source: Deutsche Energieagentur dena

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Technology: leakage reduction in the compressed-air system

- Initial situation
  - 28% of the produced compressed-air was used in the compensation of leakage losses
- Energy efficiency measures
  - Reduction of leakages in the distribution networks, in the mountings and in the connecting pipes by 5% to 23%
  - Use of speed regulated compressors
  - Reduction of electricity consumption of the compressed-air supply due to a better utilisation of the compressors
- Saving potential
  - Energy: 1.386.325 kWh/a (20%)
  - Reduction of emissions: 762 t CO_2/a

Source: Deutsche Energieagentur dena

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Technology: ventilation and air-conditioning

- Initial situation
  - An energy analysis detected a clear over-dimensioning as well as an improvement needy regulation at a building services installation

- Energy efficiency measures
  - Adjustment of supply and exhaust air quantities of the ventilation systems
  - Requirements on heating, air conditioning and hygiene
  - Reduction of the supply and exhaust air quantities
  - Control of the supply and exhaust air levels

- Saving potential
  - Energy: 2.566.000 kWh/a
  - Costs: 252004 USD
  - Invest: 289551 USD

Source: Deutsche Energieagentur dena

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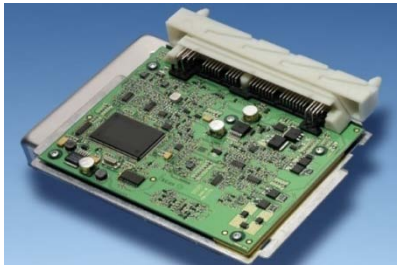
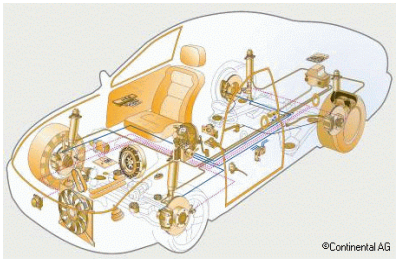
Technology: efficiency by applying used parts

- Initial situation
  - most technical innovations in modern vehicles within the electronics segment - a very dynamic market with short innovation cycle
  - obligation for supply by the automotive industry which hast to warrant the supply with technically unchanged spare parts
- Goal
  - investigation and assessment of the spare part supply strategies
- Result
  - installation of a system for the recovery and reprocessing of used parts as new spare part
  - development of a decision tool for the selection dependent from need of the optimal spare parts
  - supply strategy for the various product life cycles





Continental HELLA RETEK Recycling durch Technik

allparts System

Fraunhofer Institut Materialfluss und Logistik

Bundesministerium für Bildung und Forschung

Fraunhofer Institut Zuverlässigkeit und Mikrointegration

Source: Fraunhofer IML

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process engineering – measures for resource efficiency

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Technology: Optimization of a manufacturing method in the product development

Near net shape casting / forming

Machining from the solid

Material input 1400 g | Swarf 1070 g | Prefabricated part 330 g

Manufacturing from a pre-formed blank

Material input 450 g | Blank 390 g | Press waste 60 g | Swarf 60 g | Prefabricated part 330 g

Source: demea (2010)

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Technology: Optimization of a manufacturing method in the product development

- Initial situation
  - High share in machining waste
  - High tool wear
- Energy efficiency measures
  - Use of preformed blanks instead of solid materials
- Saving Potential
  - 50% lesser material waste
  - Lesser tool wear due to lower machining forces
  - Gain of efficiency by reducing the handling times
  - 2.370.000 € saving potential

Source: demea (2010)

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Conclusions

- Demand for energy in the industry
- Cleaner Production – a method for establishing efficiency
- Several examples for energy efficiency in the field of supply engineering

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Thank you for your attention!

Dr. rer. nat. Kathrin Hesse

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