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Sustainability in commercial laundering processes

Module 5
„Energy in laundries”

Chapter 1
Energy sources

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Content

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- Energy sources – overview
- Kind of energy sources (primary – secondary sources)
- Conversion and transport of energy
- Energy sources – definitions
- Advantages and disadvantages of different energy sources

Learning targets

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After finishing this chapter, you will:

- Know the most important energy sources
- Be able to differentiate between primary and secondary energy sources
- Know the consequences of conversion of energy and transport of energy
- Know the basic terms and definitions of energy sources and
- Be able to differentiate advantages and disadvantages of the different energy sources

Energy sources

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- **Energy sources** are natural substances and/or substances that may contain energy in several forms (chemical, nuclear). Therefore, they can be applied for energy generation or the transport of energy

- The so-called ***primary energy sources***, applicable to generate energy directly, are differentiated into ***fossil***, regenerative and nuclear energy sources. Fossil energy sources are e.g.

  coal,

  petroleum

  gas

- Fossil energy sources are limited
- Application of fossil energy sources leads to *CO_2-generation*

Energy sources

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- ***Regenerative* (renewable) energies**

  Renewable energies are:

  biomass and disposals,
  earth warmth,
  sun energy,
  water and
  wind

  Amount of primary energy consumption in Germany is about 5 %, world-wide at about 13,5 % (2007).

- ***Nuclear energy***

  application of uranium and thorium for energy generation in nuclear power plants is efficiently.

  No environmental waste due to CO_2- /other emissions.

Kind of energy sources

Primary energy sources can be converted into *secondary energy sources*

by:

burning,

nuclear fission or

oil refining

Conversion processes always mean a loss of energy

Secondary energy sources are e.g.:

Electric power,
fuel oil, kerosene
heat from a district heating network

Electric power is a *final energy*, generated by conversion (coal-/gas-/nuclear power plant) of primary energies (e.g. coal, gas, uranium)

Transport and conversion of energy

- Effectiveness of energy conversion is constituted by degree of efficiency/efficiency factor
- Gas and steam-running turbines achieve efficiency factors up to 58 %, nuclear power plants achieve efficiency factors of 33 %
- Transport of energy to consumer means additional losses

Process type	*Electric efficiency factors (netto) in %*
Nuclear power plant	*33*
Brown coal turbine (rhenish)	*36*
Hard coal/black coal/anthracite turbine	*50*
Gas-/steam turbine	*58*

source: Gesamt-Emissionsmodell Integrierter Systeme (GEMIS), Vers. 2.1; Hessisches Ministerium f. Umwelt, Energie und Bundesangelegenheiten, 1995

Energy sources/definitions

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Primary energy: energy of energy sources before conversion

Effective energy: energy at the end of a conversion chain to be at consumer`s use (e.g. light, warmth or mechanical energy)

Energy conversion: Conversion of energy of one form into another; means always a loss of energy. Quality/effectiveness of conversion is expressed by the degree of effectiveness

Energy resources: All deposits of a energy source including deposits economically not to obtain currently and deposits that still have to be discovered

Energy reserves: energy sources with established proof of existence and economically to obtain

Final energy: energy after extraction, conditioning and conversion of primary energy resources (fuels, electrical energy and heat from a district heating network

Advantages and disadvantages of energy sources

Energy source	Advantages and disadvantages
Gas	**Advantages**: very efficient, producing a low level of harmful substances when burning, highest increase of consumption of fossil energies. Supply and transport relatively ensured due to sources in the North Sea and Russia
	Disadvantages: technical costly exploitation and transport. Pipelines and tank ships necessary which transport the liquid gas at a temperature of – 162 °C
Oil	**Advantages**: relatively simple and cheap conveying possible at the moment. Universally applicable as energy source
	Disadvantages: strong dependency of imports which leads to vulnerability of national economy! High CO_2-production, unstable development of prices

Advantages and disadvantages of energy sources

Energy source	Advantages and disadvantages
Coal	**Advantages**: basic supply from own places (e.g. Germany), high share in German electricity production, transport and storage harmless
	Disadvantages: high subsidies necessary, high CO_2 and soot production, strong impact on landscapes because of mining. Application limited: liquid fuels can be produced but process is very costly
Nuclear energy	**Advantages**: efficient method of energy generation. No CO_2-generation, no dependency of political insecure raw materials supplier
	Disadvantages: radioactivity and therefore high risks, from MCA to permanent disposal of radioactive waste; Danger of terrorism and terrorist application of uranium and/or plutonium
Regenerative energies	**Advantages**: cleaner than gas, oil and coal and unlimited
	Disadvantages: technique very expensive and not fully developed yet. Not always ecological harmless. Burning of biomass causes CO_2 emission