

Sustainability in commercial laundering processes

Module 5
„Energy in laundries”

Chapter 1
Energy sources

Powered by 

- 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

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** 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 *CO₂-generation*

- ***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 CO₂- /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

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

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

Energy sources/definitions

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 an 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



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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 $-162\text{ }^{\circ}\text{C}$
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



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Energy source	Advantages and disadvantages
Coal	<p>Advantages: basic supply from own places (e.g. Germany), high share in German electricity production, transport and storage harmless</p>
	<p>Disadvantages: high subsidies necessary, high CO₂ and soot production, strong impact on landscapes because of mining. Application limited: liquid fuels can be produced but process is very costly</p>
Nuclear energy	<p>Advantages: efficient method of energy generation. No CO₂-generation, no dependency of political insecure raw materials supplier</p>
	<p>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</p>
Regenerative energies	<p>Advantages: cleaner than gas, oil and coal and unlimited</p>
	<p>Disadvantages: technique very expensive and not fully developed yet. Not always ecological harmless. Burning of biomass causes CO₂ emission</p>