Chapter 4
Energy Efficient Acting Systems

ABSTRACT

Energy efficiency relates to process, environment, and material, all effects (relationships benefit the inputs) of creative activities of matter, energy, and information. The higher the level of recognition of processing and transformation needs, the smaller a contribution of undesirable effects to the achievable objectives of the activities. The purpose of the environmental effects is to combine planning and freedom – not through impractical, impermanent compromise, but through voluntary recognition of the legitimacy of and need for both of them.

4.1. CONCEPT OF ENERGY AND EFFECTIVENESS

Integrated energy systems development in the environment: design and construction theory; materials - processes and ecological aims of bio-materials and waste technology (*Flizikowski, 2008; Flizikowski 2011; Powierża, 1997; Ministry of Economy, 2009; Sienkiewicz, 1986; Świątkowski, & Flizikowski, 2010; Ziemba, & Co-authors, 1980*). The selection of a particular type of energy technical system will depend on a number of factors: feed size, throughput, product size and type of material; also, the cost and power requirements, operational costs and environmental restrictions. Therefore, while on the question of pure application, a particular type of machine/system may be an obvious choice, the ultimate decision will probably take into account the peripheral needs and may dictate selection of a different type of machine (*Goldberg, 2003; Macko, 2000; Mazurkiewicz, 2002; Ostwald, 2005; Tarnowski, 2010; Zawada, & Co-authors, 2005*). It will not the purpose of these tutorials to evaluate machine choice on anything other than basic application requirements, as cost factors etc. can vary within short time-scales owing to outside influences. Also, geographical locations may have significant effects on costing, the principles of processing, compression, the impact and principles of screening, energy systems machinery, monitoring, system control, plant selection and layout.

4.2. ENERGY SYSTEM ANALYSIS

The global, environment-functional potential of operation, energy and renovation is analysed. According to designation, the functional potential of technical system is the whole of its external operating possibility (*Sienkiewicz, 1986*):

- **Human Potential:** $P^L(t)$,
- **Technical Potential:** $P^T(t)$,
- **Energy - Material Potential:** $P^E(t)$,
- **Controlling Potential:** $P^S(t)$.

Function of operating potential:

$$P_d(t) = \Phi\left[P^L(t), P^T(t), P^E(t), P^S(t)\right], \qquad (4.1)$$

and especially:

$$P_d(t) = \pi_d(t) \cdot M_d(t) \cdot \varepsilon. \qquad (4.2)$$

Operating (energy) potential equation in the period $[t_0, T]$:

$$
\begin{aligned}
P_d(T) &= P_d(t_o) - \int_{t_o}^{T} p_d^E(t)dt \\
&- \int_{to}^{T} p_d^s(t)dt + \int_{t_o}^{T} p_d^o(t)dt
\end{aligned}
\qquad (4.3)
$$

where:

- $P_d(t_o)$: Initial operating potential of global acting or only: bio-material, polymer- and fibre-waste or water waste, willows, oil plants, corn straw, flowing rivers, wind, sun rays, hydrogen, magneto hydrodynamics, farm bio-gas, heat pumps, oceans or the Baltic Sea, fuel cell coal and nuclear energy,
- $p_d^E(t)$: Density of effectively used stream of potential,

- $p_d^s(t)$: Density of lost stream of potential,
- $p_d^o(t)$: Density of recovered (or obtained from the environment) stream of potential.

Each of the potentials of any machine operations in the environment, as well as the environment for machines, are described by reliability-that is by the function taking into account its active and passive value, quality, which is the distance of practical effects from the pattern of theoretical possibilities.

4.3. HUMAN POTENTIAL

The reliability of human potential is defined with the following indices:

- Number of people appointed to L^L operation,
- Number of people taking part in $M^L(t)$, operation,
- The theoretical human possibilities, ε^L,
- The real creative possibilities and the level of human responsibility, $\pi^L(t)$.

For one active employee the index of reliability amounts to:

$$N^L(t) = \frac{\pi^L(t)}{\varepsilon^L} \qquad (4.4)$$

The value of the theoretical, developmental, and creative possibilities index and the reliable operation of an employee (employees) tends to one, if:

- The undoubted motivations occur, $(\varepsilon_m^L = 1)$,
- The full knowledge occurs (know-how, ecological and synergic), $(\varepsilon_w^L = 1)$,
- The free access to the canal occurs, $(\varepsilon_k^L = 1)$,

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