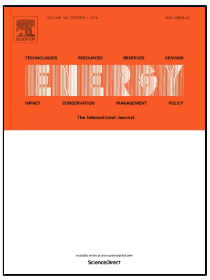
Accepted Manuscript



Systems approach to energy and exergy analyses

Andrzej Ziębik, Paweł Gładysz

PII:	S0360-5442(18)31750-X
DOI:	10.1016/j.energy.2018.08.214
Reference:	EGY 13690
To appear in:	*Energy*
Received Date:	19 June 2018
Accepted Date:	31 August 2018

Please cite this article as: Andrzej Ziębik, Paweł Gładysz, Systems approach to energy and exergy analyses, *Energy* (2018), doi: 10.1016/j.energy.2018.08.214

Systems approach to energy and exergy analyses

Andrzej Ziębik [1]*, Paweł Gładysz [2]

[1] Institute of Thermal Technology, Silesian University of Technology, Gliwice, Poland, andrzej.ziebik@polsl.pl

[2] Institute of Thermal Technology, Silesian University of Technology, Gliwice, Poland, pawel.gladysz@polsl.pl

* corresponding author

Abstract

The complexity of contemporary energy arrangements created the necessity to apply not only a process approach, but also a system approach in energy and exergy analyses. This distinction was developed at Professor Jan Szargut's Silesian School of Thermal Engineering in the 1960s, and Input-output (I-O) analysis as a method of mathematical modelling of energy systems was applied. The I-O linear mathematical model of the energy economy of an industrial plant was then developed, and the following problems were resolved:

- optimisation of the mathematical model in order to select the optimal structure of the energy economy of industrial plants within the framework of preliminary design,
- nonlinear mathematical model of the energy management of ironworks for control and scheduling,
- system analysis of the exergy losses considering the energy systems of ironworks,
- mathematical model of the energy production system of complex buildings, and
- application of the I-O model in energy and exergy analyses of oxy-fuel combustion power plants with CO_2 capture, transport, and storage.

The I-O method was also applied in the modelling of calculations of the cumulative energy and exergy consumption, cumulative emissions, and the indices of thermo-ecological costs.

Keywords:

system analysis; input-output analysis; energy analysis; exergy analysis; energy systems

Nomenclature

Main symbols

A – matrix of the coefficients of the consumption of energy carriers and materials