

## Sixth International Conference on Sensitivity Analysis of Model Output

**Decision support systems based on the economic feasibility assessment for  
Municipal Solid Waste (MSW) Management under Uncertainty using SimLab®  
toolpack,**

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**Abstract**

The purpose of this paper is to assess the economic feasibility of the waste to energy pyrolysis facility designs for City of Konin, in Poland. The economic analysis, including five Capital Budget steps (Etap), Monte Carlo (MC) simulations and SimLab® software are discussed. The benefits of a simulation modelling approach are saving in time and resources. MC simulation is often used to evaluate the risk involved in decision making. Standardised Regression Coefficients (SRC) sensitivity analysis is performed, based on the 10000 trails. Uniform distributions have been assigned for simulations.

Keywords: Monte Carlo Simulation; SimLab®; pyrolysis;

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**1. Description of Case Study**

The new Polish environmental strategy emphasizes the principle of sustainable development and it encourages the government of Konin to develop a waste management plan for their communities based on the use the technology for a gasification with waste to energy system. One scenario has been chosen: American Gasification System (design at 200 T/D). The Capital Budget – Project Costs of the American Scenario is given in Tables 1.

Table 1 Capital Budget – Project Costs of the proposed American Gasification System

Capital Budget – Project Costs (USD)		
1	<b>Etap 1-Construction Management</b>	600731.00
2	<b>Etap 2-Civil&amp; Site Design/Site Work &amp;Building Permitting, Gasifiers System</b>	21120055.27
3	<b>Etap 3-Continuous Emission Control, Monitoring Systems</b>	999599.10
5	<b>Etap 4-Automatic Loading Systems</b>	1687350.23
6	<b>Etap 5-Office Furniture and Computers</b>	425000.00
7	<b>Etap 6-Contingency Reserve</b>	1167264.40
8	<b>Razem-Total Project Costs (USD)</b>	26000000.00

## 2. Simlab® Output And Simulation Results

The principal output reports provides by SimLab®, a software package offered by SIMLAB (2009) Version 2.2 Simulation Environment for Uncertainty and Sensitivity Analysis, developed by the Joint Research Centre of the European Commission is presented in Figure 1- uncertainty analysis, and in Figure 2 (sensitivity analysis given by the *Standardised Regression Coefficients*, SRC), respectively. Based on the economic feasibility model presented in (Liberman, 2003), in this study used uniform distributions. The performance of the SRC is shown to be extremely satisfactory when the model output varies linearly or at least monotonically with each independent variable. In (Saltelli *et al*) sensitivity analysis have been presented as: “those techniques will answer questions of the type *“which of the uncertain input factors is more important in determining the uncertainty in the output of interest?, or, if we could eliminate the uncertainty in one of the input factors, which factor should we choose to reduce the most the variance of the output?”*

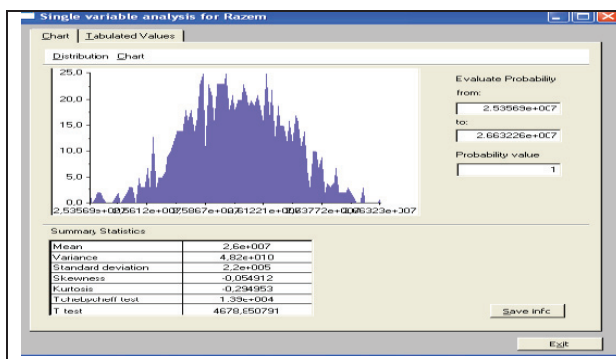


Figure 1. Uncertainty analysis of the output

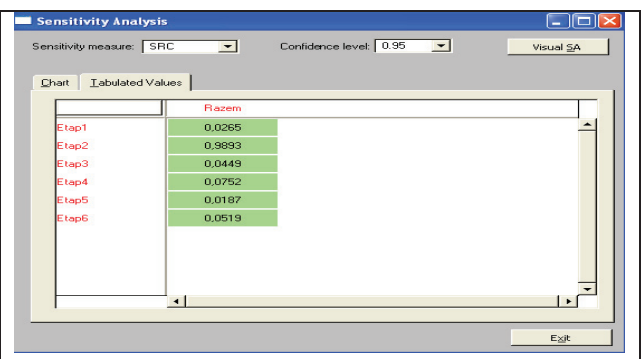


Figure 2. Sensitivity analysis (SRC) for the 95% confidential level

## Conclusions

Cost risk analysis can answer some questions that the traditional estimating method cannot. Included are:

- "What is the most likely cost?" The traditional method assumes that this is the baseline cost computed by summing the estimates of cost for the project elements, but this is not so.
- "Where is the risk in this project?" This is the same as: "Which cost elements cause the most need for the contingency?" Risk analysis principles can be used to answer this question. In this study the most likely Total Project Cost values are about 2.53563E+007 USD and 2.663226E+007 USD for the analyzed Scenario. Every manager has a different degree of aversion to risk.

## References

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