ALTERNATIVE FUELS

(713) - DETAILED EVALUATION OF TECHNOLOGIES FOR THE PILOT SCALE PYROLYSIS OF PLASTIC WASTES.

Jean-Bernard Michel (Switzerland)[1]; Drew Gamage (Switzerland)[2]; Roger Gumy (Switzerland)[2]; Christophe Pot (Switzerland)[2]; Jullen Ropp (Switzerland)[4]; Jacques Richard (Switzerland)[4]; Philippe Gaemperle (Switzerland)[3]

1 - Humana Consulting; 2 - Spontis SA; 3 - Sales Challenge Consulting Sàrl; 4 - University of Applied Sciences and Arts Western Switzerland

Draft Paper

In Switzerland, as in some other industrialized countries, plastic wastes are eliminated together with municipal wastes by incineration with thermal energy recovery ("ITER") for power production and district heating. However, although this is thought as one of the best methods to dispose of the wastes, the trend is for increased sorting, separate collection, and material recycling as it is already the case for PET bottles. In this context, an ambitious project is carried out by a group of industrial and R&D partners to find an innovative and complementary alternative with a strong ecological, economic, and societal impact.

The first phase, now completed, aimed at the comparison of best available pyrolysis technologies for distributed energy conversion plants which should be 10 times smaller or less than ITER plants.

The objective is to implement on a pilot scale a pyrolysis unit which should allow better energy recovery and thus contribute to the energy transition.

Several typical wastes already collected separately were considered for a 1500 t/year pilot plant:

- non-recyclable plastics from the replacement of electric meters by smart meters
- Food unpacking (unsold products from supermarkets)
- Agricultural plastic wastes
- Electric cable wastes

Today, the gate fees to incinerating such wastes are in the range of CHF 230 to CHF 250/tonne for agricultural plastics, about CHF 170/ tonne for unpacking plastics and electricity meters, and CHF 350/tonne for cable pellets. The logistic costs are invoiced at CHF 145/tonne.

The paper will present the results of the main completed tasks i.e.:

- Understanding of the needs of all main stakeholders: power companies, waste handling, waste recyclers, incinerators.
- Physical and chemical characterization of the above-mentioned wastes including their laboratory pyrolysis in the temperature range of 400°C-800°C, with variable residence times and different atmospheres.
- Tests on a small scale pyrolizer at a potential local supplier site.

- Analysis of the state of the art with a review of 25 technologies and requests for preliminary offers from potential suppliers. Most are continuous large-scale plants (> 100’000 t/y) producing oil for various uses. Few are in the batch mode. Very few, with capacities of 1’500-7’500 t/y, are producing syngas.

- Evaluation of selected suppliers (SWOT, Multicriteria, Financial).

- Life-cycle-analysis and impact. Three scenarios were modelled:

o Incineration (ITER),

o medium temperature (400-450°C) pyrolysis and production of diesel oil,

o high temperature (750-850°C) pyrolysis, syngas production, and combined heat and power production.

Two functional units (= goals) were used: treatment of 1 ton of plastic wastes or production of 1 kWh of energy (CHP). The results differ in both cases, but one finds that the third scenario offers important gains in terms of reduced CO_2 emissions and use of fossil fuels compared to incineration.

- Finally, a recommendation was made for the construction and operation of pilots. One for the treatment of chlorine free (or low Cl content) wastes, and one for the treatment of cable pellets with a high Cl content.

Palavras-chave : rds **Plastic wastes, pyrolysis, Life-cycle-Analysis, incineration, plastic oil, syngas**