“Waste to Product to Energy” – The Lebanese Paper Industry

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I. ALI

II. Solid Waste Management (SWM)

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I- ALI

- Overall Representative of the Manufacturing Industry in Lebanon
- Involved in Environment and Renewable Energy Related Issues since 1995
- Key Partner with the Ministry of Environment

- “Environment & Energy Department” created in March 2009 to support and raise awareness of members on issues related to green industry

- “The Green Production Help Desk” established in October 2012 which provides information and technical advice to Lebanese Industries that want to engage in the emerging green economy
II- Solid Waste Management (SWM)

The world is trying to find solutions to the problems of solid waste disposal.

Proper waste management is a key element in ensuring the efficient use of resources and sustainable growth of the economy.

The International trend today is to benefit from the waste generated as much as possible.
In this regard, ALI has a firm position related to SWM in Lebanon:

1. Proper SORTING
2. RECYCLING: Processing Recyclable Products into Raw Material
3. Generating Energy from Unrecyclable Waste
Step 1: **RECYCLING**: Waste To Product

Step 2: **GASIFICATION**: Waste To Energy

III- The Paper Industry & Its Role in SWM
Lebanon has been a pioneer in the paper recycling industry since 1929.

The manufacturing of paper in Lebanon employs 4000 employees and is largely based on the recycling of waste paper to help reduce the cost of production and maintain a clean environment.
There are 4 factories working in paper recycling, making it an essential for many other industries such as manufacturing paper for packaging, manufacturing corrugated carton boxes and book binding.

In doing so, it is providing the raw materials for the packaging sector, which in turn contributes to the packing of productive goods.

Paper waste constitutes a high proportion of the total solid waste, accounted for 17% of the waste in Lebanon.

Local factories needs of raw materials from paper waste are obtained from companies involved in the handling of solid waste, institutions, supermarkets, schools and associations.

More than 120,000 tons/year of waste paper is needed.
III- The Paper Industry & Its Role in SWM

Waste Paper & Cardboard
III- i. Recycling: Waste To Product

From WASTE

To PRODUCT
III- i. Recycling: Waste To Product
III- i. Recycling: Waste To Product

- Radiata Pine Thinnings
- Plantation to Paper
- De-barking Drum
- Chipper
- Thermomechanical Refiner
- Thermomechanical and Recycled Pulp Mix
- Cleaning and Fine Screening
- Water
- De-inking
- Paper Making Machine
- Paper to Paper
- Newsprint
- Kerbside Collection
- After Collection
- Paper to product
III- i. Recycling: Waste To Product

Waste Paper Recycling: Process

1. The recycling process is to **add water to the waste paper & cardboard** separated into grades in order to create a pulp.

2. The pulp is screened and washed to remove any contaminants, such as paper clips, staples, glue and ink.

3. The clean pulp is spread into large **thin sheets** using large rollers to be turned into a new product.
III- i. Recycling: Waste To Product

Waste Paper Recycling: Process

5. The **paper is left to dry**, and then it is rolled up ready to be cut and sent back to the shops.

*Newspaper/magazines are turned back into recycled newsprint.

*Lower grade mixed paper and cardboard are recycled into a number of cardboard based packaging products.
More than 70% of waste paper is recycled and is a new product again.
By redirecting waste to serve as raw materials for industry, recycling provides a number of important benefits:

- Reducing pollution and conserving natural resources.
- Saving energy and reducing greenhouse gases.
- Stimulating the development of greener technologies.
- Avoiding the cost of waste disposal in landfills and incinerators.

It takes 70% less energy to make paper products from recycled material than it does to make them from crude materials.
The paper recycling industry generates at the end process non-hazardous waste called rejects, composed of:

- 75% non-recyclable plastics
- 10% cellulosic fibers (paper)
- 10% water
- 5% sand, steel, glass

These rejects are converted to energy using the GASIFICATION process.

6,000 tons of wastes per year create 80,000 Megawatts of energy used in the industrial facility as electricity and in boilers.
III- ii. Gasification: Waste To Energy

Why Convert Waste to Energy via Gasification?

- Rejects started accumulating and local dumps refrained from receiving the plant’s rejects

- Proven technologies showed potential advantages into reducing waste while producing energy

- Extremely clean technology

- 1 ton of waste creates 3.5 MW of energy – equivalent to 300 kg of fuel oil

- Officially permitted by the Lebanese Ministry of Environment as responding to all environmental recommendations
Gasification Technology:

 Implemented in 2010 / Total Investment Cost: 5,000,000 USD
Gasification converts materials normally considered waste into energy:

- Gasification is the conversion of feedstock into their simplest molecules – carbon monoxide, hydrogen and methane.
- This is achieved by reacting the material at high temperatures without combustion, with a controlled amount of oxygen and/or steam.
- The resulting gas mixture is called syngas and is itself a fuel.
- The power derived from gasification and combustion of the resultant gas is considered to be a source of renewable energy.

Gasification is NOT Incineration!

Incineration is the burning of fuels in an oxygen-rich environment, where the waste material combusts and produces heat and carbon dioxide and other pollutants.
III- ii. Gasification: Waste To Energy

The Gasification Process:

1. **Collection of Non-Recyclable Solid Waste**

2. Trucks take the waste to the gasification plant

3. Waste is dropped off into a waste storage to be used as fuel

4. Waste gets transferred to the area where it will undergo thermal treatment

5. The process creates two sources of energy: steam and syngas.
   
a. **Steam** is directed to a turbine in order to produce electricity.

b. **Syngas** is treated to be cleaned up from sulfur. The clean syngas is then transferred into a gas turbine to produce electricity.
III- ii. Gasification: Waste To Energy

The Gasification Layout
III- ii. Gasification: Waste To Energy

Gasification Benefits:

✓ Pay-back Period: Around 4 years

✓ Decrease Landfill Waste and Their Negative Impacts

✓ Gradual Phasing out of Fossil Fuels

✓ Creation of 25 New Green Jobs

✓ Gasification Byproducts – Ash – are Non-hazardous and Within Acceptable Limits

✓ Inert Ash is Used for Mix in Cement Industries, Concrete and for Road Construction
III- ii. Gasification: Waste To Energy

✓ Waste Reduction: 88% in Weight & 95% in Volume
III- ii. Gasification: Waste To Energy

“Waste-to-Energy via Gasification is: clean, reliable and a renewable source of energy.”

Gasification creates fewer air emissions, uses less water, and generates less waste than most traditional energy technologies.

This innovative technology has been proven, providing a low cost, low emission solution for waste disposal.
“Maximum Valorization of All the Components of the Waste”

1- Maximize Raw Materials by:

- SORTING
- RECYCLING: Ensure that the percentage needed for the local industries is recovered.

2- Then, Generate Fuel from Non-Recyclables:

- When recycling is NOT possible, remaining waste should be turned into energy as alternative fuels.
IV- Conclusions

» Have National Strategy & Legislations to Ensure Proper Waste & Resource Management

Ensure Recyclable Waste as Raw Material for Valued And Important Industries, or else many sectors are threatened to close, resulting in job and financial losses.
I Will Be Glad to Answer Your Questions!
THANK YOU FOR YOUR ATTENTION!