20th of Marth, 2018 **Kyiv**

Business Project

NOVOVOLUNSK 20 t/h

Technical and economic description of the RDF fuel pellets production and mixed municipal waste sorting plant construction project in Lutsk city (Lutsk region).

The purpose of the project: Construction of an automated plant for mixed municipal waste sorting and RDF fuel pellets production in Lutsk city (Lutsk region) by «Technics» company (Croatia), with a capacity of 20 tons per hour (annual capacity of 86400 tons, according to the manufacturer's recommended load), followed by the possibility of retrofitting by biomass fuels production line (fuel enriched RDF).

Description of the main positions of the project: plant construction project includes: design documentation and permits development, construction of a concrete pad under the factory, supply of utilities and communications to the plant territory, delivery of dismantled equipment from Croatia and its installation and commissioning.

Brief summary:

The PT TES facility construction cost: 20 351 000 EUR – 26 500 000 USD.

Feedstock: household trash from Lutsk region;

Garbage supplier: the administration of Lutsk region;

Amount of processed garbage: 86 400 tons / year;

End product: Waste and RDF fuel (briquette);

Recycled materials consumer: Lutsk enterprises;

RDF fuel (briquette) consumer: cement plants, export (Poland);

External electric systems available: near the site;

Access roads: near the site;

Gas networks: not required;

Water: available (well);

Reserve fuel: not required.

Main body:

The easiest way to remove waste, which is used everywhere, is a burial or storage in the respective landfills (dumps). This method is the cheapest, but the recycled waste isn`t decomposing for decades and, therefore, the problem of its destruction is simply transferred in time. In addition, at this approach, resources, contained in the waste, are being lost irrevocably (organic fertilizers, metals, paper, cardboard, glass, secondary textile materials, alternative fuel, and more). It must be remembered, that each pile of garbage is a "goldmine", but also a pollution of soil, groundwater and air.

Garbage and municipal solid waste recycling and recovery is a problem in many countries, including Ukraine, which can be solved by the MBO-T technology implementing (mechanical, biological and thermal treatment) by Croatia «Technics» company - the world leader in the plants and equipment production for 100% recycling of MSW (municipal solid waste) without further landfill formation.

The foreground way to utilize waste is a waste recovery method, i.e., collection, sorting, preparation of various types of waste for further recycling (reuse). The world's highest rate of recycling is observed on such resources as paper, glass, metals, cloth, PET packaging, plastic, compost, alternative fuel.

MBO-T is a modern rational and patented technology of solid waste management, patent number R21010260A.

One of the modern society main tasks is a transition to non-waste production and vital activity. On average, each person produces about 300 kg mixed waste per year, for the city of Kiev is about 1.5 million tons of waste per year, which is now partially burned on older hardware and is mostly stored outside of the city limits. This situation has already led Lviv to disaster. Waste sorting in order to separate materials for recycling is the only right decision. Resources cost is high. Garbage accumulation leads to various toxic substances release into the atmosphere. Extracting resources from waste using modern technologies is very profitable even in Ukraine, but it requires significant investment. Subsequently, the owners of such enterprises are entitled to additional compensation from the state or directly through the Paris Protocol institutions due to severe reduction of CO2 and CH4 emissions, as well as other gases (reduction of greenhouse effect), and environmental protection. Also, we will finish building the processing and RDF fuel with biomass enrichment line (to reduce its toxicity) - to be used as fuel for biomass miniTES. Considering this, we can say with certainty, that there is no a better alternative way. This kind of plant allows to fully realize the following features:

- □ the use of waste exactly from Rivne and the satellite cities;
- □ high reliability of equipment, operating in various EU countries;
- □ possibility of operation in various modes (1 to 3 shifts per day, the possibility of varying the load - within the annual amount of set working resource;
- □ improved energy efficiency;
- □ automated process control system;
- □ low costs of raw materials processing;
- □ great opportunities for plant equipment modernization;
- □ enterprise resource in nominal mode for more than 20 years;
- □ a short-term payback - 4 years;
- □ minimum staff

The line, corresponding to the 100% automatic and manual sorting of solid waste performance, includes:

1. The transceiving chamber for receiving MSW from the garbage truck, effluent discharge and solid waste feeding to the sorting line.
2. TE-tap non-standard waste manipulation
3. ribbed conveyor for feeding the waste to the bags and boxes seam ripper, where the dust is removed
4. lifting conveyor for feeding the waste to the cage rotor
5. Separator -rotor to separate organics from the whole waste composition, drying, and secondary dust removal from the waste remaining
6. RO-LO special containers for collection and transportation of organic matter in the compost chamber
7. The car-tractor with a special device for transporting, loading and unloading of RO-LO special containers
8. The conveyor for lifting of dust-free and the dried waste on manual sorting line
9. The container sorting conveyor with manual sorting, boxes set for sorted waste with an automatic discharge and automatic feeding on the baler
10. The floor conveyor for feeding the sorted recycled waste to the wrapper
11. The magnetic separator for automatic ferromagnetic materials separation from waste
12. Elevating conveyor to fill the baler for recycled materials, with automatic punch for PET containers
13. A special filtering station for the collection of dust during, during the waste dedusting in the seam ripper bags
14. A special filtering station for collecting dust during the waste dedusting in the separator-rotor
15. A special shredder for waste shredding and preparation for RDF fraction
16. Special press for recycled fractions automatic programmed packaging
17. Special press for fraction RDF automatic programmed packing
18. Equipment for air conditioning and heating workplaces
19. The equipment for cleaning and recycling of waste and process water from the pumping station to supply treated water to the plant for washing garbage trucks chassis
20. Electrics for the sorting line electric power supply control and programming process, equipment signaling, video supervision etc.
21. All the necessary manipulative equipment: truck, tractor, and others.
22. The mobile gas station to fuel manipulative and transport equipment
23. The weight unit for weighing garbage trucks on arrival / departure on the territory of the plant
24. An automatic car wash for washing garbage trucks chassis
25. The set of container huts for the head shops office with equipment to control the whole process, monitors for supervising, container blocks for staff (locker rooms, bathrooms, showers, dining room)
26. The stock container for spare parts - workshop and a set of fire-fighting equipment
27. The stock in workshop for packaged and sorted recyclables and RDF fraction temporary storage

Equipment delivery general conditions:

Payment conditions:

75% - the first advance payment for the start of production;

25% - in being coordinated while signing the supplying contract.

Supply conditions: coordinated while negotiating.

Warranty period: 36 months from the first day of commissioning, but not more than 42 months after the installation supply to the customer.

Delivery time: 9-12 months from the first advance payment receiving date.

Quality control: In accordance with the requirements of design and technological documentation.

Installation works: the best offer to install equipment is to attract such companies as "NVK Cogeneration LLC» and «UTEM LLC».

Manufacturer supplied equipment installation supervision (equipment, commissioning, training) is performed under a separate contract.

Commissioning time (if having infrastructure) 2-4 months.

Plant constructing terms:

- 3-staged designing engineering works with all approvals and examination of design organization - 6 months.

- Production of basic equipment: 12 months.

-Installation works, if are being provided in parallel, namely the installation of the finished foundation structures, will take 2-4 months.

Economic indicators of the plant and its payback.

Recycling center type		**20 t/h**
3.1. bio waste	≈ 25%	21600
3.2. plastic, film	≈ 6%	5184
3.3. paper, carton	≈ 17%	14688
3.4. PET packaging	≈ 5%	4320
3.5. MET packaging	≈ 2%	1728
3.6. textile, rag	≈ 4%	3466
3.7. glass	≈ 3%	2592
3.8. metal	≈ 3%	2592
3.9. RDF fuel	≈ 35%	30240
3.10. Total t/year:		**86400**

4.1.	**Making Ideological and main projects and obtaining the necessary permits and approvals for the construction of recycling centers, engineering networks and communications supply**	**3 665 000,00**
4.2.	*Workshops and compost chambers for sorting, office building(materials and equipment)*	*10 745 000,00*
4.3.	*EQUIPMENT TRANSPORTATION*	*200 000,00*
4.4.	**Equipment and materials` customs value**	**10 945 000,00**
4.5.	Duty, VAT, and customs duties (about 30%)	3 290 000,00
4.6.	CONSTRUCION WORKS*	3 200 000,00
4.7.	Construction site preparation and и administrative works	3 200 000,00
4.8.	INSTALLATION WORKS	1 100 000,00
4.9.	Unexpected expenses	1 100 000,00
4.10.	**Investment for Utilization Center in total (USD)**	**26 500 000,00**

Total revenue for 1 ton of waste processing

Income name	Participation in a ton, %	Price in Euro/t	Amount in Euro/t
5.1. Proceeds from the waste discharge at the plant	1	4,00	4,00
5.2. Selling recyclables for recycling			
5.2.1. Paper and carton	0,17	89,60	15,23
5.2.2. Metal(ferrous)	0,03	115,00	3,45
5.2.3. Metal(nonferrous)	0,02	620,00	12,40
5.2.4. Textile	0,04	120,00	4,80
5.2.5. Glass	0,03	15,50	0,47
5.2.6. ПЭТ packaging (dense)	0,05	310,00	15,50
5.2.7. Polyethylene film	0,06	108,00	6,48
5.3.Raw materials for compost	0,25	6,00	1,50
5.5. RDF power units sale	0,35	20,00	7,00
5.6. Population subvention(subsidies)	1	-	-
5.7. Total income for processing 1 ton (in Euro)			**66,83**

Total costs for 1 ton of waste processing:

Design capacity of up to t/h	**20 t/hour**
6.1. Electricity - 0,06 Euro/kW/hour	0,27
6.2. Heating and conditioning - 0,06 Euro/kW/hour	0,42
6.3. Plot rent/land tax – Euro/hectare/year	0,00
6.4. Labor force , average salary - 2,50 Euro/hour	6,50
6.5. Equipment and capitol amortization - 10 years	7,53
6.6. Maintenance, spare parts and consumables	1,10
6.7. Taxes (VAT - 20%)	0,00
6.8. Workshops amortization - 25 лет	0,46
6.9. Unexpected expenses	1,00
6.9. Total expenses for processing 1 ton (in Euro):	**17,28**

The calculation of earnings and payback:

Design capacity of up to t/h	**20 t/hour**
8.1. Total income for processing 1 ton	**66,83**
8.2. Total income in USD/year	**11 548 224,00**
8.3. Total expenses in USD/year	**4 910 601,60**
8.4. Net profit in USD/year	**6 637 622,40**
8.5. Investment for Utilization Center in total	**26 500 000,00**
8.6. The plant payback in the years of net profit	**3,99**

To implement the plant building project for sorting household waste, with capacity of 86400 tons per year, a necessary credit to be obtained is 26,500,000 USD.
The estimated payback of the project 3,99 years.
The amount needed to invest in stages:
Stage 1 – 13 000000 USD, the implementation within 3 months.
Stage 2 - 13 500 000 USD, implementation within 6 months.