AGJ APRÍTÓGÉPGYÁR Kft.

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Subject: **Informative price offer to realize waste glass processing and foam glass technological line, in the form of general contracting**

The **technology** of the projected plant has been elaborated by the company **Geofil Kft.**, and now a pilot plant is operated at the Tatabánya location of the mentioned company based on this technology. Technical solutions applied in the pilot plant cannot be applied for every technology phase in case of a plant with the desired capacity (e.g., swelling, cooling and further treatment of granules), so these units are designed at a higher safety level; however, appropriate sources must be ensured for occasional corrections deriving from technology modifications to be made on the basis of what is experienced during trial operation.

For lack of factual data, the following assumptions have been made during elaboration of this offer:

- Installation of the plant is made on a site or industrial area, which is provided with the necessary infrastructure; accordingly, all necessary public utilities are available at the wall of the building to be built (electric energy, water, natural gas, etc.).
- This offer does not include terrain correction, road construction and social facilities, these are regarded as existing. Of course, if needed, we undertake to realize these, too.

2./ Description of technology

Task of the equipment: **Waste glass processing, the end-product of which is foam glass.**

Waste coming in by truck gets to a covered storage. From the storage space, the waste glass is carried up with a front loader to the feeding hopper; from here the material, by the help of a feeder, goes to the jaw crusher for pre-crushing, and then crushed glass sized about 0-50mm, through an elevator, gets to the storage bunker.

The lower part of the storage bunker is developed as a drying pit. Here the crushed glass loses its adherent moisture, and then, with a hammer mill, it is fine-crushed to a size below 5mm, and, by the help of an elevator, gets to a storage bunker. Warm air needed for drying is sucked away from the swelling kiln by a ventilator through a regulator valve. Air leaving the drier gets outside through a dust-extractor system.

Grinding of the 0-5mm crushed glass to 0-125µm is made in a ball mill, which operates in a cycle with a rotating disc type air separator. The grinding process involves an exhaust a de-dusting system. The ready-made glass powder is put to a storage silo.

Thereafter, out of the 0-125µm glass powder and the necessary auxiliary substances, after measurement, and liquid binding material added, the properly sized granulate is made in a mixing-granulating equipment.
It works in a periodical mode. The particle size of the granulate depends on the quantity of binding material, as well as on the rotation speed and dip angle of the granulating disc, which are continuously adjustable. Measurement of the glass powder and auxiliary substances is made in a hopper scale, to which materials are delivered by feeding screws. Production of the granulating solution is provided by a mixer device, and then the solution, by means of a pump, gets from the storage to the granulating facility. From the granulating facility, the material comes through a closed drying belt – where the pre-drying of the granulate is made – and a bucket elevator, and reaches an intermediate storage.

The material, coming from the silos of the granulate and of the anti-adhesive material, by feeder equipment, gets to the swelling kiln, where swelling is made at a temperature between 750 and 900°C.

The mixture of swollen foam glass and the anti-adhesive material gets to a fluid cooler, where, by the help of the cooling air (the heat content of which is utilized in the kiln) and water, the product is cooled off to cca. 80 °C. In the swelling kiln, the anti-adhesive material which is fed to avoid adherence, after the cooler, is separated by a sorter, and it is transported back through a screw conveyor to the storage silo.

Transportation of the swollen foam glass to the two storage silos is made by a chute with shifter.

Delivery of the finished product is made by vibratory feeders and a conveyor belt, and then a sieve is used to separate small particles developed during storage and transport, afterwards it comes to the storage place, from where a vibratory feed pipe feeds it to the „Big-Bag" filler.

3./ Architecture

The technological equipment is accommodated in a steel-structured building, the side walls and roof of which are provided with a heat-insulated steel trapeze plate covering. The storage silos lean on the supporting structure of the building.

The bigger part of the building is one-storied, except the operating levels under bunkers, as well as operating levels of the sorter, which belongs to the mill.

The building has windows partly openable, and properly sized doors for traffic, and it is equipped with gutters to drain off rainwater.

Supporting pillars of the building and all equipment being under a bigger load are supplied with independent reinforced concrete foundations.

Joined to the technological building, there is a roofed storage of 12 x 16m floor area without side walls and with concrete partitions, to store raw glass.

Under the feeding hopper, a pit of 3x5x2m, and, for the elevators, three pits of 3x3x2m are established.

4./ Electrical equipment

The following are included in the offer:

- Switching elements needed for power transmission and control of technological equipment.
- PLC control and computerized data processing.
- Instrumentation needed for the control of technology and regulating equipment
  - 6 pcs regulation circles (effector elements are indicated in the machine list)
  - 6 pcs temperature measurement (with remote transmitter)
  - 4 pcs pressure and draught measurement (with remote transmitter)
- Illumination
- Lightning protection and earthing network

5./ Technical data

5.1. Production data

Plant capacity		10,000 tons/year (processed waste glass)
Working time	-for preparation	4,800 hours/year (two shifts)
	-for swelling	2,200 hours/year (three shifts)
Swollen foam glass		
Aggregation density	-light foam glass	250-450 kg/m3
	-heavy foam glass	550-850 kg/m3

Size of waste glass	Max. 300 mm
Aggregation density	cca. 0.4 t/m3
Glass powder particle size	D97 = 125 µ (97 % below 125µ)
Auxiliary substances needed for swelling	
- number	Max. 3
- quantity	4 – 10 %
Moisture content of waste used	Max. 5 %
Moisture content of granulate	Max. 10 %
Fuel	Natural gas
Heating value	6,500 kcal/kg
Swelling temperature	750-900°C
Quantity of anti-adhesive material	cca. 10 %

5.2. Quantity of base and auxiliary materials needed

	Waste glass [t]	Aux. materials for swelling [10-10 %] [t]	Binding material [5 %] [t]	Anti-adhesive material [2 %] [t]	Water [m3]
per hour	2.5	0.25	0.125	0.05	1.75
per day	40.0	4.0	2.0	0.8	28.0
per year	10,000.0	1,000.0	500.0	200.0	7,000.0
specific	1,0 t/t waste glass	0,1 t/t waste glass	0,05 t/t waste glass	0,02 t/t waste glass	0,7 m3/t waste glass

5.3 Energy data

Electric energy: 3-400 V, 50 Hz
Natural gas heating value: cca. 34 MJ/m3
pressure: min. 90 mbar max. 300 mbar

	Electric energy MWh	Natural gas Nm3
per hour	0.29	70
per day	4.5	1,700
per year	1,350	500,000
specific	190 kWh/t waste glass	47 / waste glass

5.4. Other data

- ♦ Built-in total electric power : cca. 410 kW
- ♦ Built-in technological equipment, total weight : cca. 275 t
- ♦ Necessary operating personnel : 3 persons/shift

6./ Scope of delivery

- Complete building to accommodate the technology
- From the roofed storage, ensuring the receipt of the material (waste glass) which is fed into the technology, to the packaging of the finished product.
- Energy and public utilities from the wall of the technological building to the built-in equipment
- The environmental pollution material content of the air issued by the technology through dust-extractors will be below the valid limit values, on the following conditions:
- We have no knowledge of the quality of the waste glass delivered to the feeding bunker (its physical characteristics are as per 5.1) and possible liquids in it, and of the auxiliary substances used in the technology (e.g., anti-adhesive, granulate binding material).
  We have started from the assumption that these materials, getting into the technology, will not be environmental pollutants (we think of gaseous materials first).

7./ Implementation

According to the design documentation to be prepared by AGJ Aprítógépgyár Kft. and harmonized together with the Client.
Implementation will comply with the standards and regulations in force.
Surface protection: Undercoat and painting to the color as agreed with the Client.

8./ Delivery and receipt

- Handover of the plans is made after cross-checking with the Client.
- Delivery and receipt of equipment, materials, and structures are made, with prior notice, at the location of the AGJ Rt., by making a survey based on the documentation, and after the delivery a protocol is to be drawn up.
- Completion of the on-site, complete architectural, engineering and electrical fitting work is closed by the drawing up of a protocol.
- Subsequent to commissioning and trial operation, the final acceptance is closed by the drawing up of a protocol.

9./ Guarantee

Calculated from the date of commissioning, we undertake 12 months operational guarantee for each equipment, under professional operating mode specified in the operator's manual. It cannot be more than 24 months after delivery. Our guarantee does not apply to wear parts; however, we express our readiness to continuously deliver, under separate agreement, these parts, too.

10./ Payment conditions

- Based on partial and final invoices, as specified in the contract
- Settlement of invoices to be made within 15 days by bank transfer
- A pre-condition of contract concluding is, from the Client's side, to ensure a bank guarantee of payment for the 100% value of the investment

11./ Delivery deadline

- 1-3 months from entering into contract – authorization plan and official licensing
- 3-6 months from entering into contract – implementation plans

- Production of mechanical and electrical engineering products, assuming the continuous supply of plans, 6-7 months from the start of plans
- Building up of a steel-structured hall – 4 months from entering into contract (during production)
- Time needed for on-site mechanical and electrical fitting works – 3 months
- Commissioning, trial operation (hot-cold tests) – expected time is 1-2 months

- Total time needed by investment, trial operation included, is about 15 months from the date of entering into contract.
- Labor safety qualification of machines is ensured in 6 months after commissioning.

12./ Sales price: an informative price of HUF 1,115,000,000 +V.A.T.

As detailed in the attachment, in a location in Hungary.
This price is valid in case of ordering the complete technology.
The following are included in the price:

- preparation of authorization documentation, contribution in official licensing
- complete technological, architectural, mechanical and electrical implementation planning
- complete mechanical and electrical production
- transportation to the spot
- architectural implementation
- complete technological fitting work of mechanical and electrical type, commissioning, and participation in the trial operation
- the trial operation is planned to last for a maximum of 2 months. In case the trial operation, due to technological problems, extends longer than that, than, subsequent to the payment of the final invoice, a separate agreement will be needed for the further contribution.

The price does not contain costs arising from technology modifications possibly required.

13./ Free of charge services of the Client

- official licensing
- ensuring of work area and installation site
- establishing the necessary energy supply, needed for implementation and operation, up to the wall of the technological building
- safeguard of materials transported to the spot
- ensuring of base material and energies needed for trial operation

14./ Note

It is possible to develop a requirement exceeding 10,000 tons/year out of the machines defined in this offer, in a modular system, and the crushing preparatory plant can be realized as demanded.