Project:

Østfold Avfallssortering IKS - MRF

Title:

APPENDIX A3

PLANT AND PROCESS DESCRIPTION

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1 GENERAL

The MRF sorting plant of Østfold Avfallssortering IKS will sort residual household waste. The plant shall have a capacity of minimum 40 tons/h, 60.000 tons/year in one shift. This should be able to be extended to 2 shifts in the future.

2 PLANT AND PROCESS DESCRIPTION

This description is based on the block diagram, attachment 1 to this document. In this document we describe the material flow through the sorting process and refer to the various steps and equipment as visualized in the block diagram. The block diagram and this description shall be considered as a suggestion, and we expect the contractor to offer his best solutions based on his own experiences. The main goal is to design a process that perform on both the asked yield and quality on the different fractions. It should also fit into the given space in the process hall.

For structuring the process, the description is divided as follows:

- Reception and input storage
- Sorting plant:
    - Shredding and classification
    - Mix plastic sorting
    - Mix paper sorting (option)
    - Metal sorting
    - Fines sorting (option)
    - Bunker Belts, Baling and Loading
- Source extraction of air for de-dusting
- Compressor Plant
- Cooling / Heat Exchanger System Compressor Plant

2.1 Reception and input storage

Incoming vehicles with waste are weighed (Client responsibility) before entering the reception area in the building.

For unloading, the vehicles drive to the designated reception area and tip the waste on the floor. After unloading, the vehicles leave the building and drive to the outgoing weight. The delivery can be by vehicles with compaction systems, specialized- or standard container trucks, as well as containers from stationary compactors / transfer stations.

2.2 Sorting Plant

2.2.1 Infeed, shredding and Classification

Loading of the residual household waste is done by an excavator with sorting grab into the hopper/ feeding conveyor. In the same operation, the operator will sort out detected unwanted objects. The arrangement of the loading area shall also enable loading with front wheel loader.

The household waste is then transported into the shredder. The shredder will ensure that the bags are opened and reduce the size of the larger material down to a manageable size. Most household waste is bagged in ordinary shopping bags; hence it is important that all bags are opened to facilitate downstream classification and sorting.

The two drum screens will separate the material in 4 different sized fractions. The contractor shall suggest sizes that are optimal for the following sorting.

Oversize from the drum screens:
Oversize particles from the drum screens are transported by conveyors back to the shredder for re-shredding.

Large and medium fractions from the drum screens:
The large and medium sized particles from the drum screens will be transported with conveyors to NIR 1, NIR 2 and NIR3 for polymer sorting.

The small fraction from the drum screens:
The small fraction from the drum screens will be transported via conveyors to a following magnet and eddy current for metal sorting before the fraction is transported on a conveyor to the container compacting station for the residual.

2.2.2 Mix plastic sorting

A total of nine NIR machines are included in the mix plastic sorting:

Polymer sorting	**NIR Separator**	**NIR Recovery**	**NIR Cleaner**
Large	NIR 3*	NIR 6*	NIR 9*
Large	NIR 2*	NIR 5*	NIR 8*
Medium	NIR 1*	NIR 4*	NIR 7*

*See block diagram for reference.

The ejected material will be transported by conveyors to the mix plastic bunker. The non-ejected material goes to metal sorting - or mix paper sorting if option A is included.

2.2.3 Option A – Mix Paper Sorting

A total of three NIR machines are included in the mix paper sorting:

Mix paper sorting	**NIR Separator**	**NIR Cleaner**
From NIR 5	NIR 10*	NIR 12*
From NIR 6	NIR 11*	

*See block diagram for reference.

The solution shall be able to switch between positive – negative sorting to positive – positive sorting.

The ejected material will be transported by conveyors to the optional mix paper bunker. The non-ejected material goes to the magnet and eddy current for metal sorting.

2.2.4 Metal sorting

Waste stream after sorting of mixed plastic and mixed paper as well as the small fraction is sorted for magnetic and non-magnetic metals.

Ejected material from the magnet plastic/paper sorting will be transported on a conveyor to the FE container together with the ejected material from the magnet that handles the small fraction. Ejected material from the eddy current will be transported on a conveyor to the NE container together with the ejected material from the eddy current that handles the small fraction. It shall be possible to change the FE and NE containers without disrupting or stop in the sorting process.

The arrangement shall as a basis have separate containers for FE and NE. However, it shall be possible to route the FE and NE to one container station for mixed metal.

The non-ejected material from the eddy current is transported on conveyors to the container compacting station for the residual.

2.2.5 Option B – Fines

This option makes it possible to sort further on the small fraction. The non-ejected material from the eddy current on the small fraction goes to a flip-flop screen or similar for dividing it into two separate fractions sizes. The fraction < 15mm is transported on conveyors to the container compacting station for the residual. The fraction > 15mm goes to NIR 13 (see block diagram) for sorting on mix plastic. The ejected material from NIR 13 is transported to mix plastic cleaner. The non-ejected material shall be possible to route together with the waste fraction to the container compacting station, or to a container filling station for transport to a downstream plant for further sorting.

2.2.6 Bunker Belts, Baling and Loading

Bunkers for the following fractions is included in the setup:

- Mix plastic
- Mix paper (**option A**)

These are both equipped with bunker belts, able to discharge its contents to feed the baler via the discharge chain conveyor.

All bunkers will be filled from the discharge end. When filling the bunkers, each applicable conveyor belt must be in stop position. A level gauge sensor at the filling point will signal on reaching the maximum to the control system and the conveyor belt is started backwards for a set time. Material will be transported to the bunker's back end and the bunker may be continued to be filled. This process is repeated until the bunker has sufficient material to be baled.

Bunkers are equipped with a weigh or levelling system and are coordinated through an automated bunker management system. The content of each bunker is constantly monitored, and with the user-entered parameters pressing time, material flow and end weight of bale, the bunker management system can control the bunker discharge and the baler. The bunker content, the material flow and the calculated quantity of bales are displayed on the operator stations.

The baler and bunker system shall be programmed to avoid risk of blending of the different sorted materials.
After baling, the bales will be picked up using a forklift or a loader with a bale clamp and stored in the designated area of the storage hall or loaded directly onto trucks for transport.

Residual waste not sorted out as separate fractions to be routed to a stationary compressing station. Containers shall be filled automatically. When one container is full, it shall be released from the compressing unit, moved aside and an empty container shall be hooked up for filling. Change of containers shall be online and not require any stop in sorting plant.

2.2.7 Option C – Baling of delivered source separated paper

This option includes a feeding system for source separated paper that shall be fed with a Front wheel loader. The feeding system shall be located in the outgoing storage hall and shall be integrated in the bunker management system for the other bunkers and baler. The paper quality from Option C shall be kept separated from the paper quality in Option A.

2.3 Air extraction and treatment

2.3.1 Source Extraction of Air, de-dusting

The Client will provide the building with a ventilation system for inlet air to the hall.

The Contractor has to provide an analogue signal or a number of binary signals which refers to the actual airflow rate of the de-dusting system. The hall ventilation can then be run with an adapted airflow rate to ensure that there will be no overpressure inside the hall to emit dust and odour to the environment.

There is a high focus on working environment and the source extraction of air for de-dusting to be delivered by the Contractor shall aim for a lowest possible dust emissions at all the relevant points, such as drum screens, NIR machines and the transfer points of conveyors.

The filter systems are positioned outside of the process hall. To avoid condensation inside the filter housings, fans and the outside piping system, these parts must be equipped with a thermostatic heating system and an insulation.

The dust-free exhaust air after the bag filters is then discharged via a fan to a stack.

The dust that is filtered out will be transported onto conveyor belts together with the fraction that goes to the container compacting station for the residual.

At the first dust discharge point after the filters, a water spray system prevents the dust from swirling up. A thermostatic heating system prevents the water pipes and valves to freeze during winter.

2.3.2 Option D – Odour reduction system

This option includes an odour filter to be installed to reduce the emission of odour from the stack. The need for filter will be based on emission distribution analysis to be performed by Client.

The filter systems is foreseen located outside in ambient air an shall be in operation during all weather conditions. Hence, necessary thermostatic heating system and insulation must be provided.

2.4 Compressor Plant

The compressor plant delivers compressed air at right quality for all process equipment and consumers. In addition, the compressor plant shall provide pressurized air for cleaning purposes, air-powered tools and on-site units.

The dimensioning of the compressor plant has to be made so that, for summer operation mode and winter operation mode, two different classes for the compressed air dew point are achievable.

The compressor plant is equipped with refrigeration dryers for summer operation mode and additional adsorption dryers for winter operation mode.
The switching between summer and winter operation mode has to be done manually according to the outside temperatures.

The compressor units are partially redundant, with fixed and frequency-controlled units and a superior compressed air controller to ensure the amount of compressed air needed for the process. The superior compressed air controller also takes care about the operation time of each device. The compressors will work alternating in such a way, that all of them will have nearly the same operation time, so that the regularly maintenance will be at the same time for all compressors.

Fresh filtered air from the outside is sucked into the compressor room.
The function must be so that an overpressure always is guaranteed in the compressor room.

2.5 Cooling / Heat Exchanger System Compressor Plant

The cooling of the compressor units is done by oil/water heat exchangers and a chiller outside at the roof. All needed material is in the Contractors scope of supply.

The cooling system has to be designed in such a way, that the compressor system can run autonomous in the case that no heat will be taken away from the building.

The interface are the main valves at the wall of the compressor room.

In the Contractors scope of supply is the main piping inside the compressor room with the connection to all compressor units. Interface is the opening in the wall. All pumps,

heat exchanger for the building ventilation system and piping outside will be delivered by the Client.

The temperatures of in- and outlet are shown in the process flow chart diagrams “Compressor Plant” (attachment 2.1) and “Cooling Water Circuit” (attachment 2.2).

3 Attachments

Attachment 1	“Block Diagram”
Attachment 2.1	Process Flow Chart “Compressor Plant”
Attachment 2.2	Process Flow Chart “Cooling Water Circuit Compressor Plant”
Attachment 3	Process Flow Chart “De-dusting and Ventilation”