Waste incinerating plant

Descrption for treating municipal solid waste
in a save enviromental surrounding

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INDEX

FOREWORD

Planning the project for the supply of a plant for treating MSW for Minsk Bielorussia, it is important to describe the plant itself, that is done in order to separate mechanically the product flow coming from the trammel to the collection line, through the gasification of dry section – RDF. That will be sent to a plant, that realizes sin-gas than used for moving the engine for energy cogeneration. To the collection of the organic section through production of stabilized compost and to the collection of ferrous and not materials present in the mix of waste.

The following description must be considered as a modular example to be developed depending on the real necessity of quantities product in Minsk Bielorussia.
Some structures and machineries could be changed in dimensions, so to let have a better management and economy of the plant.
In the case of increase of the units, we will have to consider the distances in order to organize, at the best, the transport on trucks, so to decide where to locate the second or the third plant in the city suburbs.

The described plant can treat 336 ton/day of urban solid waste, that cause a production of following flows:

a) 75 ton/ day of RDF sent to the energetic valorization through the gasification in absence of oxygen ;

b) 205 ton/day of product from secondary trommel that produce 80 ton/day of stabilized and refined compost through treatment line ;

c) 56 ton/day of treatment refuse , not recyclable, destined to be sent to landfill;

d) 5 mw of electricity produced by “CICLO-OTTO” engines for cogeneration.

Considering a MSW production for each person 700 gr /day , the plant , we are proposing, is for 480.000 inhabitants.

Hereafter we are explaining the project and the description of the process of the proposed plant, that we think, is a rational answer to the need of unifying the recycled material and the valorization of waste, moreover taking in consideration that the plant transforms the waste in thermic and electrical energy.

DESIGN DATA

The installation subject of our proposal is sized based on the following data:

➢Total capacity	t/y	107.500
➢Day capacity	t/d	336
➢Hour capacity	t/h	24
➢Day work per year	d/y	320

➢Input materials	Municipal solid waste	
Composition		% of weight
➢ Organic fraction	%	54,0
➢ Bulks materials	%	7,4
➢ Plastic	%	13,20
➢ Paper	%	5,60
➢ Wood	%	5,0
➢Textile, leather	%	1,80
➢ Metal	%	6,0
➢ Glass	%	2,0
➢ Stones	%	5,0
➢ Hazardous waste	%	2,0
TOTAL	%	100,0

BALANCE MATERIALE

Referring to the above mentioned data and to the composition of treated refuses, hereafter we show some details about balance material, in order to determine the principal product flow out coming from the selection plant and particularly :

- organic flow from trammel before the transformation in compost ;
- organic material after the transformation ;
- RDF, refuse derived fuel, to be transferred to the incinerator unit .

The a.m. balance materials, even thought to be considered approximate, because we presume the composition of waste, let us know the exact dimension of the treatment machine and how much output we get from the plant .

The exact list of balance material is the following:

1. table one: analysis of incoming waste;
2. table two: phase of selection 1÷ 8;
3. table three: production balance of refined compost.

The table one and three are subdivided in other treatment phases, that point out every technological passage foreseen by the plant and precisely:

- **Phase 1: total incoming waste per hour;**
- **Phase 2: product flow from secondary trommel < 80 mm transferred to biological stabilization;**
- **Phase 3: product flow from primary trammel > 80 mm transferred to subsequent phase of treatment;**
- **Phase 4: metal flow caught by overband;**
- **Phase 5: product flow of primary trommel sent to the ballistic separator;**
- **Phase 6: product flow of secondary trommel < 60 mm generated by ballistic separator;**
- **Phase 7: heavy refuse flow generated by ballistic separator;**
- **Phase 8: RDF flow generated by ballistic separator;**
- **Phase 9: total organic product flow from secondary trommel transferred to selection;**
- **Phase 10: total lost of steam from process of biological stabilization;**
- **Phase 11: compost flow;**
- **Phase 12: refined compost flow from primary trommel;**
- **Phase 13: compost flow to densimetric table;**
- **Phase 14: light refuse flow generated by densimetric table;**
- **Phase 15: heavy refuse flow generated by densimetric table;**
- **Phase 16: refined compost flow.**

Table 1- analysis of incoming waste

Minsk Bielorussia

Waste type: **Municipal solid waste**

Productor: **Minsk Bielorussia**

Ton/h:	**24,00**	capacità oraria linea di selezione e produzione RDF
Day	**320**	giorni di lavoro anno
h	**14**	ore di lavoro giorno
Ton	**107.520,00**	capacità anno impianto di selezione
Ton	**336**	capacità giorno impianto di selezione
RDF	**74,43**	ton totale RDF prodotto giorno

Composition	TOTAL MSW		TOTAL	PAKAGIN		
	% sul tal quale	Ton/h	% sul totale	Ton/h	%	relativa
Organic fraction	**54,00**	12,96				
Bulks materials	**7,40**	1,78				
Plastic film	9,00		9,00	2,16	34,88	
Plastic bottles	2,70		2,70	0,65	10,47	
Other plastic	1,50		1,50	0,36	5,81	
Total plastic	**13,20**	3,17	**13,20**	**3,17**		51,16
Paper	4,60		4,60	1,10	17,83	
OCC	1,00		1,00	0,24	3,88	
Total paper	**5,60**	1,34	**5,60**	**1,34**		21,71
Wood	**5,00**	1,20				
Textile, leather	**1,80**	0,43				
Allumino cans	1,00		1,00	0,24	3,88	
Steel	4,00		4,00	0,96	15,50	
Other metal	1,00					
Total metal	**6,00**	1,44	**5,00**	**1,20**		19,38
Glass	2,00		2,00	0,48	7,75	
Stones	3,00					
Totale stones	**5,00**	1,20	**2,00**	**0,48**		7,75
Azardous waste	**2,00**	0,48				
TOTALE	**100,00**	**24,00**	**25,80**	**6,19**		**100,00**

Table 2- phase of selection 1 ÷ 8 RDF production and organic fraction flow:

step process			1	2	3	4	5	6	7	8
ton/h			24,00	14,82	9,18	0,82	8,36	0,52	2,53	5,32
%			100,00	61,76	38,24	3,40	34,84	2,15	10,54	22,15
			Total	Organic Fraction	Refuse primary trommel	Metal	RDF imput ballistic separator	Fine Fraction Ballistic Separator	Havy fraction Ballistic Separator	RDF fraction
Composition		**% of weight**								
· Organic fraction		**54,00**	**12,96**	**11,15**	**1,81**	**0,00**	**1,81**	**0,34**	**1,18**	**0,30**
· Bulks materials		**7,40**	**1,78**	**1,69**	**0,09**	**0,00**	**0,09**	**0,01**	**0,06**	**0,02**
· Plastic		**13,20**	**3,17**	**0,07**	**3,10**	**0,00**	**3,10**	**0,07**	**0,10**	**2,93**
· Plastic film	9,00									
· Plastic bottels	2,70									
· Other plastic	1,50									
· Paper and cardboard		**5,60**	**1,34**	**0,06**	**1,28**	**0,00**	**1,28**	**0,03**	**0,00**	**1,25**
· Paper	4,60									
· OCC - Cardborad	1,00									
· Wood		**5,00**	**1,20**	**0,18**	**1,02**	**0,00**	**1,02**	**0,07**	**0,57**	**0,38**
· Textile, leather		**1,80**	**0,43**	**0,00**	**0,43**	**0,00**	**0,43**	**0,00**	**0,00**	**0,43**
· Metal		**6,00**	**1,44**	**0,35**	**1,09**	**0,82**	**0,27**	**0,00**	**0,26**	**0,01**
· Alumino cans	1,00									
· Steel	4,00									
· Other metals	1,00									
· Stones		**5,00**	**1,20**	**1,20**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
· Glass	2,00									
· Stones	3,00									
· Azardous waste		**2,00**	**0,48**	**0,12**	**0,36**	**0,00**	**0,36**	**0,00**	**0,36**	**0,00**
	TOTAL	***100,00***								
		U	**35 ÷ 45%**	**40 ÷ 50%**	**18 ÷ 25%**	**0%**	**18 ÷ 25%**	**18 ÷ 25%**	**18 ÷ 25%**	**18 ÷ 25%**
		Kg/m³	**250 ÷ 350**	**350 ÷ 450**	**120 - 180**	**300 - 400**	**120 ÷ 180**	**120 ÷ 180**	**120 ÷ 180**	**120 ÷ 180**
		ton/h	**24,00**	**14,82**	**9,18**	**0,82**	**8,36**	**0,52**	**2,53**	**5,32**

Table 3 – production balance of refining compost:

step process			2	9	10	11	12	13	14	15
ton/h			14,82	6,12	8,70	1,19	7,51	0,23	1,53	5,74
%			61,76		58,70		50,67			38,76
				41,30		8,03		1,56	10,35	
			Total organic fraction	Water loast	Organic after aerobic treatament	Refuse trommel refining compost	Compost imput densimetric table	Light fraction refining compost	Havy fraction refining compost	Compost refining
Composition		**% of weight**								
· Organic fraction		**75,20**	11,15	5,57	5,57	0,50	5,07	0,21	0,17	4,68
· Bulks materials		**11,38**	1,69	0,51	1,18	0,00	1,18	0,01	0,18	0,99
· Plastic		**0,47**	0,07	0,00	0,07	0,06	0,01	0,00	0,00	0,01
· Plastic film	9,00									
· Plastic bottels	2,70									
· Other plastic	1,50									
· Paper and cardboard		**0,42**	0,06	0,01	0,06	0,05	0,01	0,00	0,00	0,01
· Paper	4,60									
· OCC - Cardborad	1,00									
· Wood		**1,21**	0,18	0,04	0,14	0,10	0,05	0,00	0,04	0,00
· Textile, leather		**0,00**	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
· Metal		**2,38**	0,35	0,00	0,35	0,35	0,00	0,00	0,00	0,00
· Alumino cans	1,00									
· Steel	4,00									
· Other metals	1,00									
· Stones		**8,10**	1,20	0,00	1,20	0,00	1,20	0,00	1,14	0,06
· Glass	2,00									
· Stones	3,00									
· Azardous waste		**0,84**	0,12	0,00	0,12	0,12	0,00	0,00	0,00	0,00
	TOTAL	***100,00***								
		U	50 ÷ 60%	100%	30 ÷ 40%	20 ÷ 25%	25 ÷ 35%	20 ÷ 25%	20 ÷ 25%	25 ÷ 30%
		Kg/m³	305 ÷ 450	1.000	400 ÷ 500	200 - 300	400 ÷ 500	120 ÷ 180	500 ÷ 600	400 ÷ 500
		ton/h	14,82	6,12	8,70	1,19	7,51	0,23	1,53	5,74

In conclusion the elaboration of material balance, although in precautionary measures, show, that the capacity of the project of treatment line and RDF production is equal to the total capacity of treatment line of 336 ton/day, that is able to produce a RDF quantity of 75 ton/day on two turns of seven hours of work/day.

DESCRIPTION OF THE PROCESS

The plant described in the project, is formed by phases of complementary treatment and is done inside cover buildings located in an area, whose measures must be 20.000 m², completely surrounded by a perimeter fence, with regulated and checked accesses.

The buildings are characterized by the technological line built inside, from which they take the name as follows:

a) Service building in the entrance a weighting bridge;
b) Waste selection and RDF production building;
c) Refining compost building;
d) Refining of organic material building ;
e) Gasification area;
f) Power generation building.

The conveyor means (trucks) will have the inside access through a principal door located on the long side of the area directly to the service building and after the checking and weighting operations, they will direct towards the other buildings following a road with double cart way, that links all the operative areas, the entrance and exit of the plant. The exit will be done through a second door on the same side of entrance.

To mitigate the plant we have forecast in the surrounding territory to sow, along the perimeter, some trees .

The lay-out of access and of inside operative areas has been studied in the respect of safety rules and in order to obtain the best use of spaces also in relation to the material flows to move.

MSW treatment

The arrival trucks to the plant, after the check, must go towards the selection and treatment building located in front of the principal entrance .

The reception building, nearby the weighting bridge, is 70 meters wide, 60 meters long and 10 meters high under the ceiling. It must have a waterproofing cement floor and metal girders ceiling , no walls on sides .

Moreover inside there are two walls built in reinforced cement, that subdivided the building in three sections, named:

- Reception area;
- Treatment and selection area;
- RDF stocking area.

The trucks go to the reception area, where discharge the material on the cement floor.

The total surface of reception area is of 1.750 m² - 25 x 70 meters – of which about 1.200 m² for the stocking material, while the exceeding space will be left to a first selection of the incoming material, to the primary shredder, to the belt and chain extractor and feed, and to the location of two landing containers, that receive the refused waste during the sorting operation on the floor .

Considering a stocking high of 2,0 meters and a medium density of the material in entrance of 300 Kg/m³, the capacity of the stocked material is equal to 700 ton corresponding to two days of input material .

The reception area is managed by an employer using a forklift and an other one who uses a bobcat, they provide to stock the material and/or to supply the treatment plant . Also to the first choice in order to avoid incidental unfitted material – in general encumbering waste – that will be stocked in containers and than sent to the landfill.

Checked the material the employer with the forklift, will put it on the bag opening ripper. It has a triturating drum with slow rotation that open bags, discharging them and operate a first triturating in order to make homogeneous the material for the next phases of treatment.

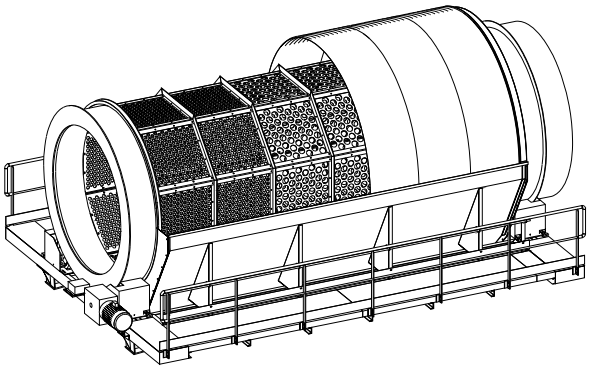
The out coming products are conveyed to an inside chain from the primary shredder to a conveyor belt and than transferred to a trommel.

The conveyor belt transfer material from the reception area to the treatment one through the separation wall.

The treatment area is the technological part of the plant, where are located the machineries for selection and production of RDF. .

The estimated area is of 1.225 m² - 35 meters wide and 3 meters long – completely occupied by the machines and the conveyor belts.

When the product reaches the trommel , is separated into organic material, named secondary trommel – that has pieces inferior to 80 mm- and into coarse material, named primary trommel , through holes on several sieves (please see the image).



The secondary trommel falls on a hopper that guides the material on to the collection-up conveyor to the refining compost building , hereafter described.

Before this material leaves the building an overband extracts from the product flow the metal fraction, through an electromagnetic device self-cleaning and crossing the collection up conveyor. The coarse material- or primary trommel – more of 250 mm – coming out of the trommel constitute the base for RDF production, consequently is further on refined, through several places of treatment, in order to fit to the RDF plant.

First of all an electromagnetic separator extract the ferrous material fraction and than an induced current separator extract the metal not ferrous.

The primary trommel flow is than transferred by a conveyor belt to the ballistic separator, in order to extract the rolling bodies (as stone, glass, building material, potteries) from the flat bodies (paper and plastics).

In the ballistic process the separation of each piece, in a current flow, happens due to the different curves of flight. The input material falls on an inclined and rolling plane, that through the rotating movement gives an impulse that generates a movement of contrary flight of each single piece .

During this phase every piece behaves differently: the light and flat pieces, as paper, medium size cardboard, plastic, film, tissue, are thrown up along the flat and low trajectories and transported by the rotating movement on the plane towards high in direction of superior hopper arranged for light fraction.

The heavy and spherical pieces are thrown up through the movement of the bottom and carried, by the inclination itself, in a flight position towards the low of the machine, where the discharge hopper is located.

The final flow is separated by holes on the sieve present on the treatment bottom.

The final and rotating bodies flow, generated by the ballistic separator, is intercepted by a belt conveyor that transfer the material to a stocking container ready for the landfill. This flow that is about the 20% of total input waste, is the refused fraction that is not recyclable and not reusable in the line of treatment.

The current of the flat bodies – or on the other hand the light material - flow reduced by the ballistic separator, that is about 20 ÷ 25% of the total input waste, is the RDF that must be reduced of dimensions according to the treatment plant.

Consequently the flow is transferred from the ballistic separator through the belt conveyor to two secondary shredders with a drum at low number of revolution, that have an opposition grid, in order to determine the exact size of product flow .

The last shredder RDF goes on an evacuation conveyor, made with chains and rolling shutters, that transfer it to a second phase trommel to verify the dimension as for the first phase.

The material goes to the sieves through the rotation and inclination of the machine. The product flow, that has size inferior to 40 mm, pass through the holes on the sieve and falls on a conveyor belt that transfer it to a second conveyor to a third section of the treatment building dedicated to the RDF stocking, just to wait to be transferred to the valorization unit .

This section is very similar to the treatment building, it occupies a surface of 1220 m². Inside it the material is stocked on the floor stored up by a transfer conveyor.

The oversize material, instead, is discharged on a line of conveyor that transport it again to a secondary shredder, so to be again reduced.

Line for biological stabilization and refined compost

The proposed plant for biological stabilization, has an area where the putrescible fraction, separated by the mechanical treatment , is stocked.

According to the amount of the input waste treated in the sorting line and according to the percentage of organic substances in the waste of 50%, this plant is done to treat :

- 70.000 ton/year
- 205 ton/day

The biological stabilization of organic substance (compost) is necessary to complete the process , so we do two essential considerations:

- ✓ to reduce the danger of organic fraction in the MSW;
- ✓ to produce compost to be used as mould for covering the landfill and/or environmental rehabilitation.

To treat this fraction, we have foreseen a covered area of 5500 m² and opened on the sides, the floor is made of waterproof cement on which channels for air transportation and for recovering the percolate produced by the maturation of organic substance, are built.

The stabilization area is closed to the treatment building.

The process of aerobically stabilization of organic substance is very easy and consists in the development of the micro bacterial flora inside the organic material, that change the organic substance into mineral ones.

In this plant the technology is very easy, in fact the material coming from the sorting line, is stocked in trapezoidal piles on the cement floor and daily turned over by a big machine (called turning over piles, as Scarab or Greenzly) .

The green and/or organic waste that is recycled and treated by a grinding mill is also carried to this plant.

The out coming product flow treated by the sorting line of dimensions inferior to 80 mm, is put on the cement floor by the conveyor where an operator with a bobcat provides to form piles on the air channels, into them, using external fans, the processing air is blown in order to maintain aerobical condition, for the transformation of the product.

Every 4 ÷ 5 days the piles are turned over by specific machine so the product is in contact with the external air and it is enriched by oxygen.

The process has an acute phase of one week, where the inside temperature reaches the 55° C degrees, than it has a stabilization for about 40 days and the pile becomes cooler due to the lower microbial activity .

The evaporation of the water and the hygienic situation of the product, with a lost of volume of 40% respect the initial one, is due to the temperature and to the action of microbes.

After 45 days the piles are transferred to a cleaning line, technically called refining line, with a capacity of 10 ton/hour. The formed mould , 15 mm size, goes into the trommel, when reaches dimensions inferior to 15 mm goes to a densimetric table in order to eliminate the inert material, the ultra light material (plastic and films) and whatever is not suitable for the process.

The obtained refined mould is put down , by belt conveyor, outside the building in an area called refining zone, where it forms again a big pile that is not technically air treated , for a period of 45 days.

During the ripening time the pile is turn over with a lower frequency than the first phase with the same machines.

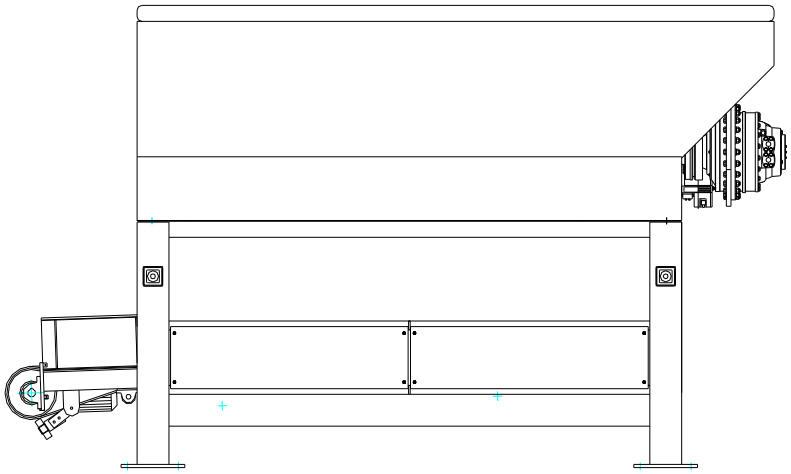
At last after 90 days the material is ready to be used as mould for covering landfill and/or rehabilitation of environmental degraded areas.

We can resume the advantages of the realization of this line for waste reduction, as follows:

- recovery of organic fraction of waste totally of 50% on the amount transported to the plant;
- reduction of danger of organic substance through the biological stabilization in a controlled area;
- creation of 5 jobs on two shifts to manage this section;
- production of compost to reclaim polluted areas or as covering mould.

PRIMARY SHREDDER

Service Bag opener



Description

The bag opening ripper is an efficient and versatile machine, for triturating the urban solid waste and similar residuals.

Thanks to the 17 teeth positioned on the drum, the material is ripped and passed through the hydraulically closing comb. If an unbreakable body is introduced, the comb opens automatically and allows the ejection of the object; then, it closes again automatically.

All parts of the drum support and of the comb are of wear-proof steel, and assure a long duration and a high reliability over the time.

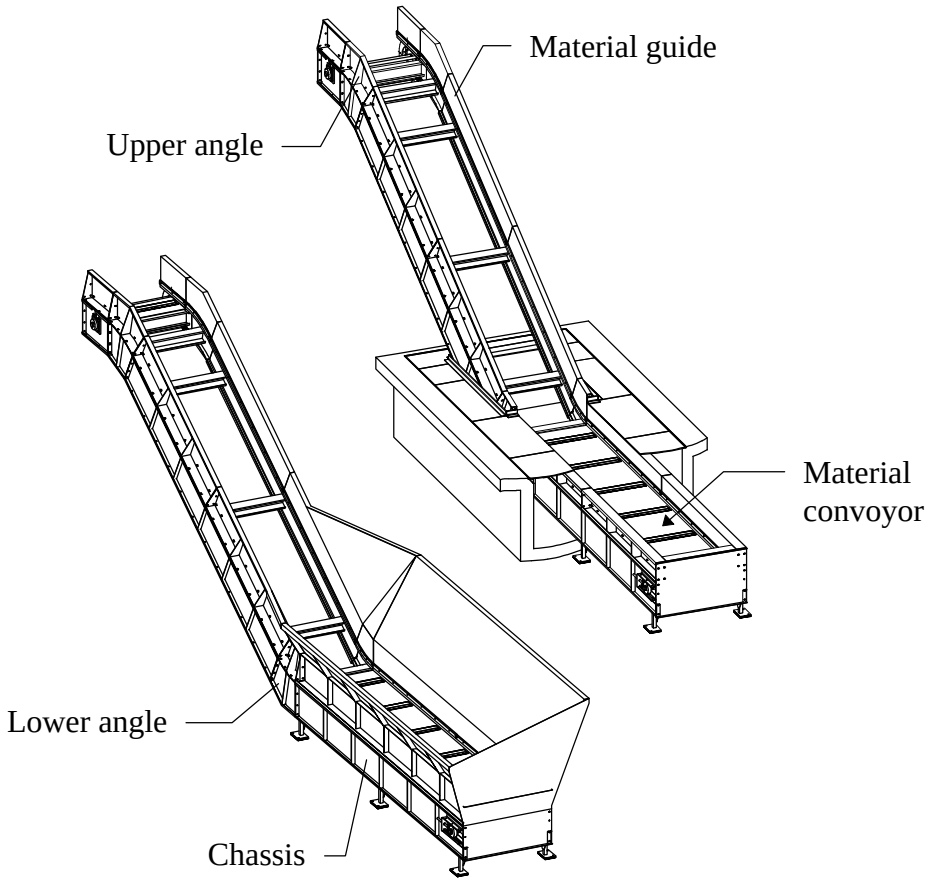
The processed material is collected on the bottom and transferred outside by means of an ejecting belt.

The shredder can be quickly installed and maintained. All elements are centralized in the control board, to operate the machine with absolute safety.

This shredder is completely realized according to the severe quality standards DIN ISO 9001, and complies with all EC standards. It is TUV certified.

BELT AND CHAIN EXTRACTOR AND FEED

Service Feeder baling press



A) Purpose

This conveyor has a belt attached to 2 drive chains. It transfers material from a loading area (in a pit or above ground) to a sorting belt, a baler press, a trommel . . .

B) Dimensions

× Range of standard belt widths:

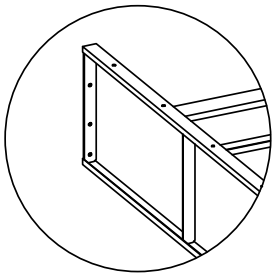
☑ 1000 mm ☑ 1200 mm ☑ 1400 mm ☑ 1600 mm

× Geometry (range standard) :

Length		
Horizontal section (m)	Sloping section (m)	Upper section (m)
4	*depends on output height*	1
6	*depends on output height*	1
8	*depends on output height*	1

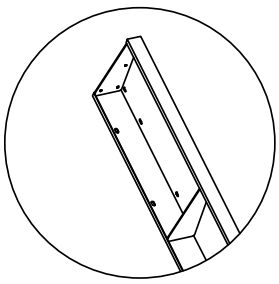
× Slope : 30 °

C) Technical characteristics



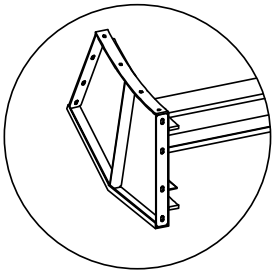
❶ Chassis

The chassis is formed of 2 pressed steel plate sides, with reinforcing gussets. The sides are joined by pressed steel plate spacers. Dust collection plates are fitted underneath the chassis along the length of the conveyor.



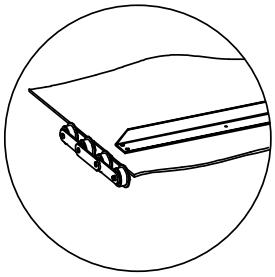
❷ Material guides

Of the same construction as the chassis with sealing skirts. The guides are 500mm high.



❸ Lower and upper angles

These modular elements are bolted to the other elements of the conveyor. They are of a welded construction and are extremely rigid.



❹ Conveying the material

The material is conveyed by a belt with bars (every metre) to transfer material more effectively. The chains are joined by U-shaped supports every 250mm underneath the belt, supporting it along its whole length.

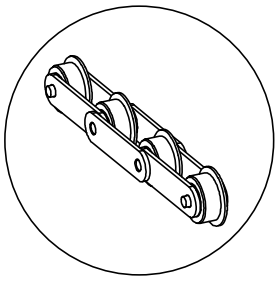
➢ Belt

Dunlop 400 PVC A (oil resistant):

- ☑ one ply woven carcass, fully PVC impregnated.
- ☑ coating thickness: 4 + 2 mm
- ☑ total thickness: 8 mm
- ☑ strength: 400 N/mm

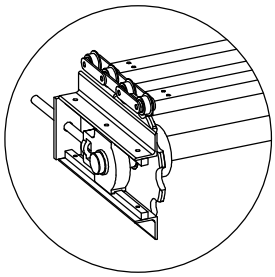
This belt is particularly suitable for handling loose material in plants where operating conditions are extremely difficult: heavy materials, materials falling from a great height or risk of tearing. This is made possible by the following features:

- × particularly high resistance to impacts,
- × exceptionally high resistance to lengthways rips,
- × unaffected by chemicals,
- × good adhesion between coating and carcass.



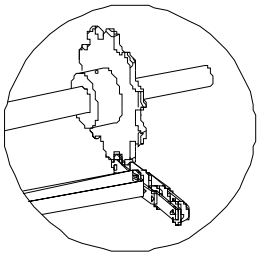
➢ Drive chain

The ISO solid shaft drive chains with flanged rollers move on wear plates. Each chain can carry at least 112 kN, i.e. 22.4 tonnes for the 2 chains together. Each chain is made of a series of articulations joined by side plates. Each articulation has a shaft and a sleeve on which the flanged roller rotates. The shaft and sleeve are made of tempered, surface hardened steel which enables the articulations to withstand high pressure. There is a quick connector every 3 metres.



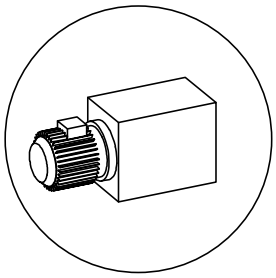
➢ Lower mechanism

The lower shaft is supported by two UKT tensioning bearings and has a keyed sprocket wheel and a free sprocket wheel with bronze bearing. This free sprocket wheel allows for play in the chain.



➢ Upper mechanism

The upper shaft is supported by two SN surface mounting bearings and drives the chains via two keyed sprocket wheels.



➢Drive

The conveyor is driven by a 3 kW hollow shaft geared motor. The gear box has helicoidally gears and a conical drive. The efficiency is between 95% and 98%. The output shaft of the gear box connects directly to the upper drum shaft. The geared motor rating is at least 1.25 times greater than the continuous load. It is sealed to IP55.

➢ Lubrification

There are chain lubrication reservoirs on both sides of the conveyor. They have a drop-by-drop valve for lubrication.

❺ Maintenance

There are inspection hatches along the whole length of the conveyor for access. The upper part of the chains can be accessed by removing the material guides.

❻ Personnel protection

☑ emergency stop cable running along the length of the conveyor on each side of the conveyor

.

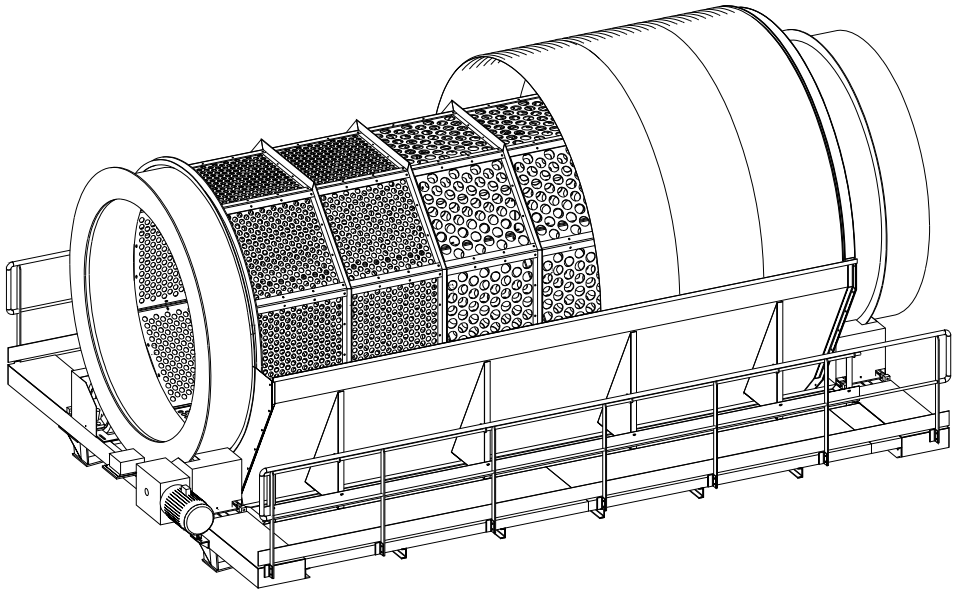
☑ protective guards at the lower and upper ends of the conveyor, guards on the inner angles at the drums.

❼ Standards

Conforms to CE standards.

TROMMEL PRIMARY AND SECONDARY

Service M.S.W. screening.



A) Purpose

This trommel sorts the material through one or several sieves (2 or 3). It also mixes the material and controls the amount of waste at the output of the trommel.

B) Dimensions

× Range of standard trommel diameters :

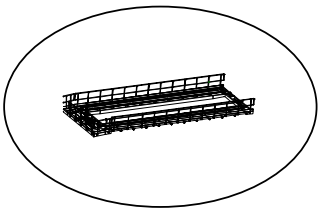
☑ ∅ 2 m ☑ ∅ 2,5 m

× Range of standard length sieves :

☑ 6 m ☑ 7 m ☑ 8 m ☑ 9 m ☑ 10 m ☑ 11 m

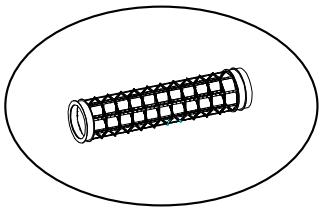
× Standard slope : 2° ÷ 4°

C) General technical characteristics



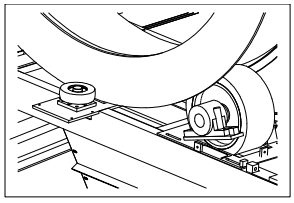
❶ Chassis mounting

The chassis is a welded and bolted UPN section frame. This structure carries the 4 supporting wheels, the 2 end wheels, the drive and the various material output hoppers.



❷ Trommel

The trommel has rings at input and output which act as tracks. They are built with an octagonal (or cylindrical) metal framework and perforated sheet steel. The flat (or curved) perforated sheets are bolted to the framework. This method of assembly (using self-locking nuts) ensures that the trommel can be easily and quickly dismantled. The trommel is fully enclosed in a ridged, curved, galvanised, pre-painted sheet steel dust cover.



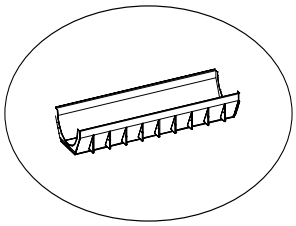
❸ Rotation

The tube rolls on 4 solid tyre wheels, one of which is driven. Each wheel is supported by two SN surface mounting bearings (adjusted using a conical housing). The driving wheel is keyed to the shaft. There is a sprocket and chain transmission from the motor to the wheel shaft. The motor has a mechanical speed controller (pulley + belt) and a helicoidally gear box. The distance between the wheels can be adjusted using compression screws. The two end wheels are supported by bearings that can be adjusted to eliminate axial play in the trommel. The trommel rotates at between 4 and 16 rpm.

❹ Feed hopper

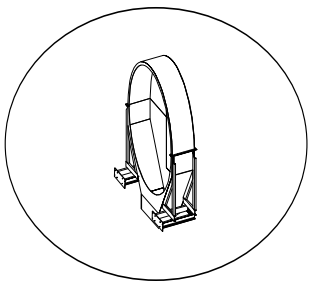
This sheet steel hopper guides the material from the time it falls on to the feed conveyor to the first perforated sheet steel plates.

❺ Selected material hopper

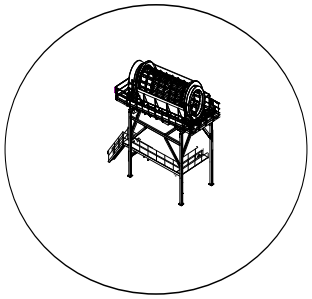


This hopper collects the material passing through the sieve. It is made of stiffened sheet steel and welded sections. It has 4 inspection hatches (2 on each side). Underneath this hopper is a take up hopper (or up to 3 hoppers) which carry the material to a collection conveyor or skip. This collection hopper has the same construction as the selected material hopper and may be fitted with a guillotine to be used as a buffer, for example while the skip is being changed.

❻ Reject hopper



At the end of the trommel, the material that is too large to pass through the sieve falls into a reject hopper which carries it towards a collection-up conveyor. It is made of stiffened steel sheet. This hopper completely covers the end of the trommel and has a lockable man way, which in turn has an inspection cover.



❼ Frame

The trommel is carried by two concrete gantries (or a metal superstructure).

❽ Personnel protection

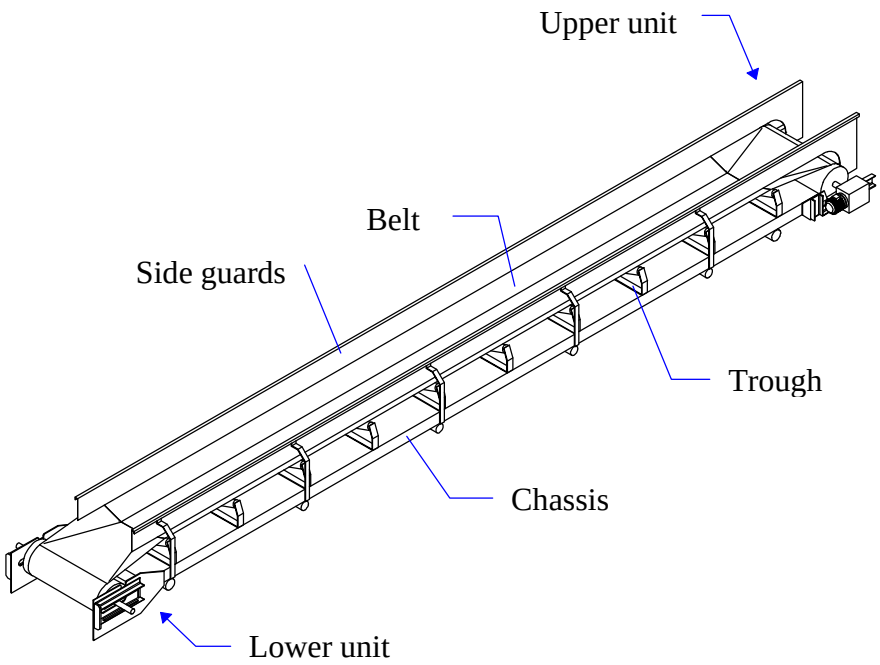
☑ dead man's handle emergency stop on each side of the sorter.
☑ protective guards round each of the 4 wheels.

❾ Standards

Complies with CE standards.

CONVEYOR BELT

Service connection between the various sections of the system.



A) Purpose

This conveyor has a belt supported on rollers forming a trough to transfer material from a collection area to an output point.

B) Dimensions and slope

× Range of standard belt widths:

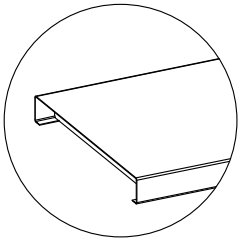
☑ 650 mm ☑ 800 mm ☑ 1000 mm ☑ 1200 mm ☑ 1400 mm

× Maximum slope: ☑ 18° to 20° with a smooth belt,

☑ 30° to 40° with a herring-bone belt, depending on the material carried.

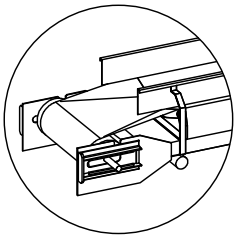
For conveyors more than 40m long, a tensioning counterweight should be fitted to maintain the belt at the correct tension.

C) General technical characteristics



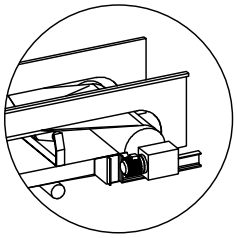
❶ Chassis

The chassis is made of pressed steel plate which ensures the stability of the whole conveyor as well as providing a dust collection plate. The lower and upper units, the rollers supporting the trough and the return rollers are all mounted on this chassis.



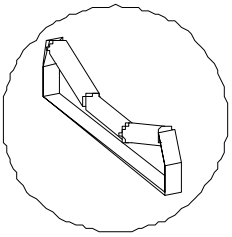
❷ Lower unit

The lower unit has a convex 400mm squirrel cage drum which keeps the belt centred and tensioned. The drum is supported by two UKT sealed tensioning bearings. The bearings are adjusted using a conical housing. Each bearing has a screw for adjusting the conveyor belt tension.



❸ Upper unit

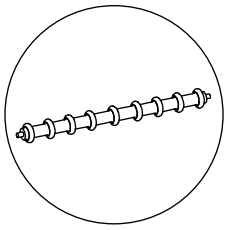
The upper unit has a drum and drive unit. The 400mm drum is convex and covered with an 8mm thick rubber sleeve with a diamond tread. It is supported by two SN surface mounting sealed bearings (adjusted using a conical housing).



❹ Trough former / rollers

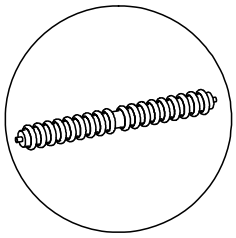
☑ 20° trough formers:

The trough formers are bolted at one metre intervals to the chassis and have 3 mining rollers supported by sealed ball bearings. Where material is loaded onto the conveyor, the rollers are 250mm apart. All the trough formers are galvanised.



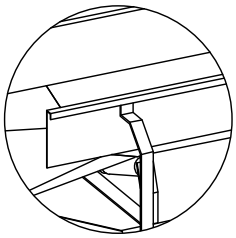
☑ Return rollers:

The return rollers are self-cleaning. They are fitted at most every 3 metres and are supported by sealed ball bearings. These rollers have elastomer rings.



☑ Tension rollers :

There are two self-cleaning tension rollers near the drums, underneath the belt return. They have twice as many rings as the return rollers so that they do not deform the belt. They have adjustable mountings to allow the belt to be tensioned easily.



❺ Material side guides

Along the length used for transport, the material is guided by pressed plates with 8mm thick rubber skirts (the upper parts of the guides are 400 mm above the bottom of the belt). These adjustable height skirts press against the belt on each side. Where the guides are in contact with the material, coach bolts are used to prevent any risk of the material jamming.

❻ Belt

☑ Oil resistant range

	Belt width (mm)	Strength (N/mm)	Ply	Thickness of coating(mm)	Type
Standard	650-800 1000-1400	250 400	2 3	3+1 4+2	ROM ROS
Extra range.	all	400	3	4+2	ROS

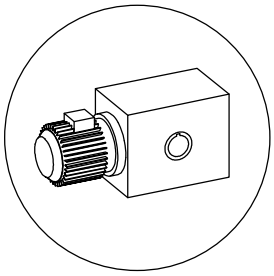
☑ Abrasive materials range

	Strength (N/mm)	Ply	Thickness of coating (mm)	Type
Standard	250	2	3+1,5	RA
Extra range.	315	2	4+2	RA

❼ Cleaning the belt

☑ *Lower scraper :* "stone remover" type with V-shaped rubber strip (20 mm thick) operating above the belt return.

☑ *Upper scraper* : steel creusabro blade attached on the chassis by two SC01 Paulstra flexible mountings, the pressure can be adjusted and it automatically compensates for wear.



❽Drive

The conveyor is driven by a hollow shaft geared motor. The gear box has helicoidally gears and a conical drive. The efficiency is between 95% and 98%. The output shaft of the gear box connects directly to the upper drum shaft. The geared motor rating is at least 1.25 times greater than the continuous load. It is sealed to IP55. The conveyor speed is normally between 0.8 and 1 m/s.

❾ Personnel protection

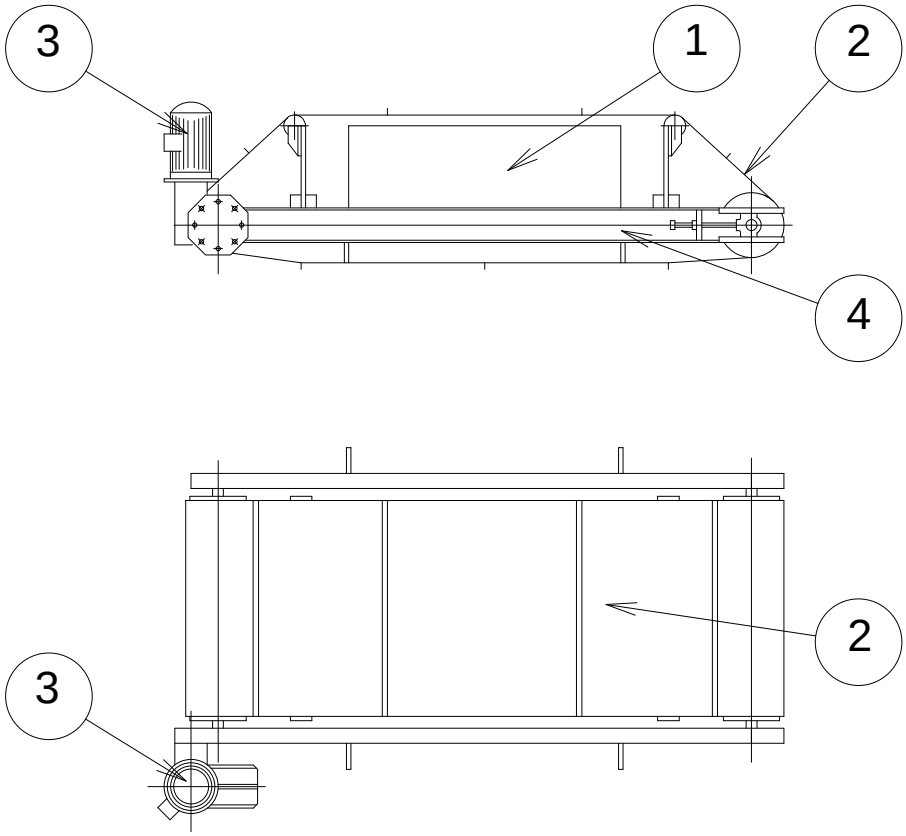
☑ emergency stop cable running along the length of the conveyor on each accessible side of the conveyor that can be used at any point by an operator.
☑ protective guard at the lower end of the conveyor
☑ guards on the inner angles at the drums
☑ guards below the return rollers of the conveyor in critical areas (where there is access).

❿ Standards

Conforms to CE standards

OVERBAND

Service captation and ejection of ferrous materials



❶ ELETTROMAGNET
❷ CONVEYING BELT
❸ BELT MOTORIZATION
❹ MAGNET STRUCTURE

A) Operation and surroundings

This separator enables the metal fraction to be extracted from the product flow.

It is fitted across and above the belt or lengthwise at the conveyor head.

There are 3 versions:

- Permanent magnet
- Electromagnetic
- Electromagnetic with alternating poles

B) Main technical specifications

❶ Frame
The machine welded frame is made of folded sheets and sections. In its upper part, the frame has 4 lifting eyebolts for shackles, U-bolts and threaded shanks. Using this the separator's position may be finely adjusted relative to the bottom of the belt.

❷ Rollers
The rollers are machined with a camber to centre the belt correctly. They are mounted on sealed bearings. A screw tensioning device at the foot enables belt tension to be adjusted.

❸ Electromagnetic device (as required)
The magnetic circuit is made of mild steel and the reel of wire or aluminium strip. The electromagnet is designed to obtain great remote efficiency. For overbands with alternating poles the area at the end of the pole plate allows the captured parts to rotate about themselves. This device allows unwanted items picked up with ferrous materials to be eliminated.

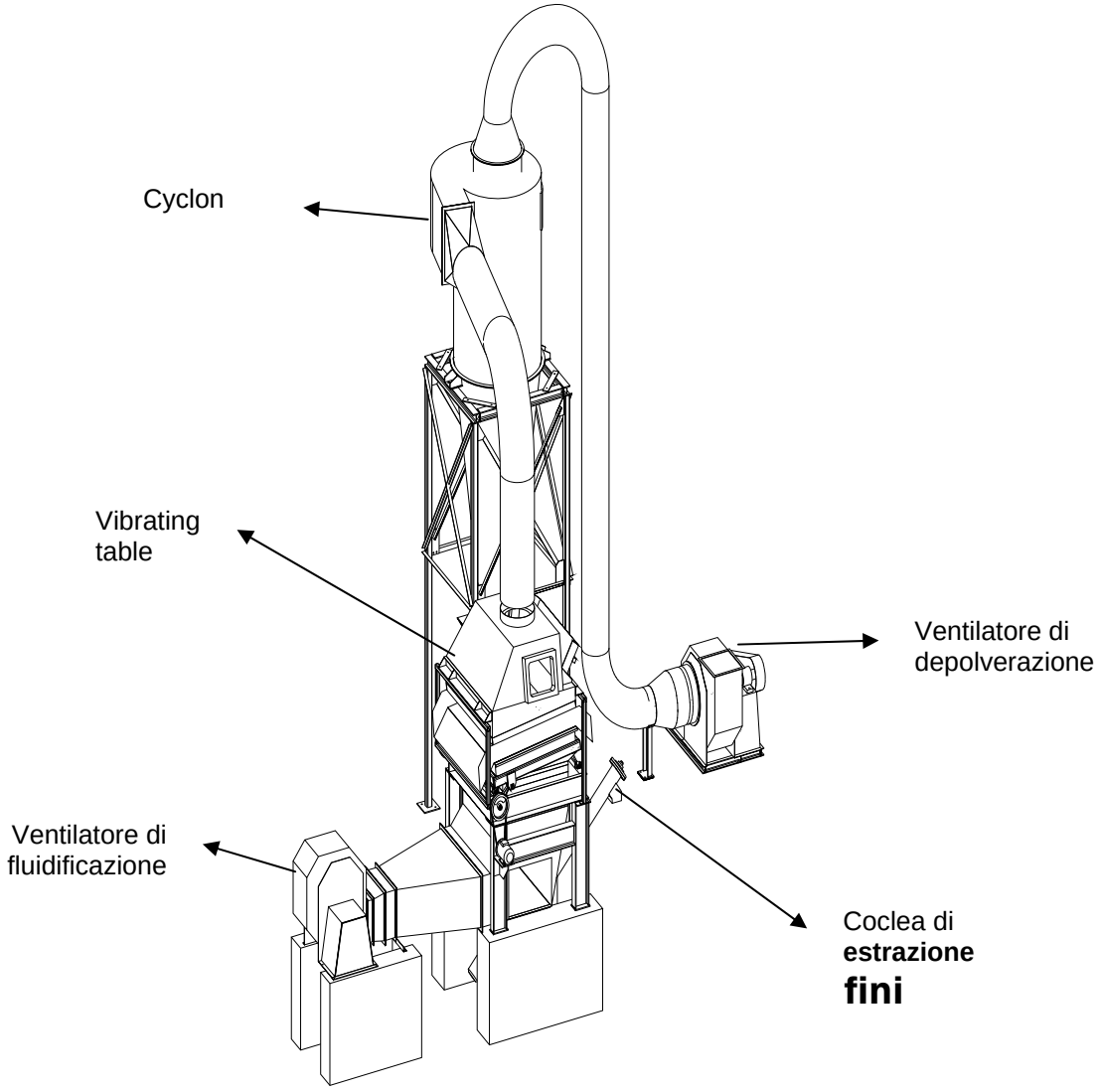
❹ Belt
The rubber belt is fitted with strips for removing, from the magnetic field, the ferrous material previously extracted from the layer

❺ Personnel protection
☑ «Punch type» emergency stop on the local control box.

❻ Standards
The machine complies with the EC standards.

DENSIMETRIC TABLE

Service refining compost



ELECTRICAL SYSTEM

General

The planning shall comply with the criteria of standard CEI 0-2 “Guide for project definition of electrical plants”.

Plants to be implemented according to the current technique, complying with all standards and laws that are valid at the beginning of the works. Also the employed devices shall comply with these standards.

In particular, the following standards apply:

Std. CEI 64 - 2 (Appendices “A” & “B”)	:	Electric installations in areas with major fire risks
Std. CEI 64-8	:	Electric installations with nominal voltage not exceeding 1000 V AC and 1500 V DC.
Std. CEI 81-1	:	Protection of structures against lightening
Std. 01/03/68 n° 186	:	Manufacture of electric/electronic materials, devices and installations.
Law 05/03/90 n° 46	:	Safety of installations
DPR 06/12/91 n° 447	:	Implementation of Law 46/90
DPR 27/04/55 n° 547	:	Prevention of accidents on the working place Prescriptions of the competent Fire Division. Prescriptions of the competent Power Authority.

All main components shall be IQM acknowledged, EC marked and shall comply with the dimensional UNI tables.

TECHNICAL SPECIFICATIONS OF MATERIALS AND INSTALLATION.

Gangways

- The gangways to be used as a cable support shall be of the cross-beam version, of zinc coated "sendzimir" steel, for internal use, with closing cover in the vertical sections, of size suitable to avoid the overheating of the cables, and complete with all accessories for bends, derivations, reductions, bracket and support connections.

Piping

The piping to be used shall be:

- Rigid heavy-duty of PVC RK 15 UNEL 37118 (IMQ) for installation under the floor ;
- Zinc coated metal UNI 3824 for open installations, power systems, for cable guide and support.

The inside diameter of the piping shall be at least 1.4 times the diameter of the circumscribed circle of the cables (minimum 16 mm). The bending diameter shall not be less than 6 times the external diameter of the pipe. Derivation shall be carried out by means of suitable boxes.
The piping shall be vertical and horizontal. No obloquies section shall be allowed. The total bending angle of the pipes between two subsequent boxes shall not exceed 270°.

Cables and conductors.

Cables and conductors comply with the dimensional standards of CEI and UNEL.
Power cables shall be of the reinforced version, with fire-proof threads, according to CEI 20 - 22, of electrolytic copper, insulated through rubber G7 and coated by PVC of Rz quality, with the following denomination symbol: RG 70FR according to CEI 20-32.
Cables and conductors for lighting installations shall be of the non-reinforced version, fire-proof according to CEI 20 - 22 of electrolytic copper, insulated through rubber G7 with the following denomination symbol: FG 7.

Dimensioning according to standard CEI 64-8 and to the following specifications

- project temperature 50° C
- coltage drop: main uprights 2%
- voltage drop: power installations 4%
- not exceeding 80% of the capacity defined by the maximum temperature and the installation standards.

Anyway, the minimum sections shall be:

➔ power installations 2,5 mm^2;

➔ signals and controls 1,0 mm^2;

➔ not reinforced cables and conductors shall be positioned within gangways or pipes inhibiting any mechanical damage (see previous paragraphs).

CONTROL BOARDS.

Low voltage boards installed in the selection and refining building.

Including:

- Metal structure, thickness min. 1.5 mm, modular for anchorage to floor and wall, front access, useful spare space 20%;
- Painting with epoxidic varnish RAL 7032;
- Segregation according to "Shape 4" of standard CEI 17-13/1;
- Outlet for lines with automatic magneto thermal switch (removable);
- Motor outlet with fuses, contactors and thermal relays sensible to one phase missing;
- External protection degree min. IP 55 according to IEC 529.

Low voltage boards installed in the control room and in the cabin.

Same features as above, but protection degree IP 31 according to IEC 529.

Mid-voltage boards.

The mid voltage board (QMT) features:

- Metal structure, minimum thickness 2 mm, divided into approached, modular compact columns (protected version);
- insulation of switches in SF 6;
- operating voltage 20 kV;
- nominal current 250 A
- external protection degree, minimum IP 2 X according to IEC 529;
- implementation according to standard CEI 17-6

Automatic magneto thermal switches

Automatic magneto thermal switches feature:

- interruption power not less than the value displayed on the electric diagrams;
- modular to be inserted on guide DIN 35;
- nominal voltage 380 V 50 Hz, intervention curve type “C”;
- teetra-polar version, according to standard CEI 23-3.

Automatic differential switches

Automatic differential switches feature:

- interruption power not less than the value displayed on the electric diagrams;
- nominal voltage 380 V 50 Hz;
- nominal differential current 30 mA;
- modular, to be inserted on guide DIN 35;
- differential releases, sensible to continuous or pulsating eddy currents, operating also id neutral of phase current is missing;
- tetra-polar version, according to standard CEI 23-18;

COMPLETION CARTPENTRY

Service various sections of the plant

Description

Including all metal works, of any kind, not belonging expressly to the equipment or machinery, such as:

1. external/internal iron ladders;
2. grates;
3. floors and elevations, overload up to 400/cm^2
4. all ladder and gangways supporting works, as well as profile and pipe sections inserted into concrete layers.

The various parts are projected and carried out according to the present technical standards. The whole metal carpentry shall be supplied “painted according to specifications”

Materials

To be used: round, broad and flat profiles of Fe 37 B and Fe 52 B UNI 5334/64, sheets of Fe 37 C and Fe 52 C UNI 5335/64.

Bolts and anchorages according to standards CNR - 10011; but never less than Fe 42 B.

For friction junctions, the mechanical and size features of the high-resistance bolts shall comply with the standards CEI-ENPI 5744/66.

Metal balustrades

Metal balustrades can be:

a) of stationary type, uprights of tube, diameter suitable to the position or function of the balustrade, handrail of tube or other section, and foot shaped and reinforced foot protection ;
b) removable type, with tube uprights (removal is possible), positioning of masonry and metal works, fastening plugs and protection chains
c) tubular type for ladders with uprights and handrails of a suitable diameter (tubular handrail)

Each type of balustrade shall be completed with the connections and surfaces for fastening to concrete and/or metal works, so that no vibration shall occur, complying with the ENPI standards.

Zinc coated grids

Zinc coated grids, foreseen for an overload of 400 kg/m^2.

Grid supports to be implemented with profile frames, suitably zinc coated on the edges (in masonry).

CARPENTRY FOR HOPPERS AND SLOPES

Service material guide to outlet.

Description

Including all metal works of any kind, not included expressly in the equipment, but assuring a connection, to form channels, assuring that the material does not overflow during the unloading operation.

Hoppers of steel sheet, thickness 3 – 6 mm, suitably reinforced, if required, by means of a profiled frame.

PAINTING

- Trommel sieve supporting structures, conveyor supports, conveyor structures, roller beds, hot-galvanized catwalks and ladders;

- Sieve trommel, loading and unloading sieve hopper painted with a cleaning cycle, rust-proofing primer, RAL yellow finish 1028.

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