SUTCO® REFERENCE.

SORTING PLANT FOR
LIGHT WEIGHT PACKAGING
LOCATION: GERNSHEIM, GERMANY

CONSERVING RESOURCES THROUGH INNOVATIVE ENVIRONMENTAL TECHNOLOGY.

Sutco® RECYCLINGTECHNIK
LM GROUP

SORTING PLANT FOR LIGHT PACKAGING WASTE GERNSHEIM

TURNKEY PLANT FOR SORTING MORE THAN 22 Mg/h LIGHT PACKAGING MATERIAL IN 3 SHIFTS.

CUSTOMER:
MEILO Gesellschaft zur Rückgewinnung sortierter Werkstoffe mbh & Co. KG, Gernsheim, Germany

CONSTRUCTION TIME:
March 2017 - March 2018

INVESTOR/OPERATOR:
MEILO Gesellschaft zur Rückgewinnung sortierter Werkstoffe mbh & Co. KG, Gernsheim, Germany

CAPACITY:
SORTING PLANT: 22 Mg/h; 120,000 Mg/a; in 3 shifts

SCOPE OF SERVICE:
Concept, design, production, delivery, assembly, commissioning, training, maintenance and service after commissioning.

FEEDING AREA

Wheel loaders transport the input material into the dosing feeder. The sturdy truck weigher arranged in front of the crusher weighs the wheel loader with its loaded bucket when it enters the weigher. A rough throughput of the sorting plant results then from the measured difference between the first value and the weight of the wheel loader with its empty bucket when it leaves the weigher. The above-mentioned dosing feeder was developed from a slowly running two-shaft crusher with a special shaft geometry, providing a uniform feed, an opening of the collection bags and waste bags as well as a dissolution of contingent material tangles. The material thus prepared is transported to the first of three trommel screens for a classification by the discharging belts.

CLASSIFICATION

The belt conveys the light packaging material to the first trommel screen, producing the three grain size classes mechanically:

- **A fraction of 50 x 50 mm in the front area (2 screen shots)**
- **A fraction of <148 mm in the second area (2 screen shots)**
- **A fraction of <222 mm in the third area (4 screen shots)**
- **A fraction of <327 mm in the fourth area (2 screen shots)**
- **A fraction of >327 mm in the overflow**

Two coarser fractions are conveyed to the downstream wind sifters, and the fine fraction is conveyed to the trommel screen. Here, two grain size classes are produced:

- **A fraction of <100 mm (4 screen shots) in the underflow**
- **A fraction of <136 mm in the second area (4 screen shots)**
- **A fraction of <176 mm in the third area (2 screen shots)**
- **A fraction of >176 mm in the overflow**

The overflow is conveyed to the wind sifter, and the underflow is conveyed to the next trommel screen. Here, two other grain size classes are produced:

- **A fraction of <50 mm in the underflow**
- **A fraction of >50 mm in the overerflow**

The overflow is conveyed to the wind sifter, and the underflow is conveyed to the vibrating screen. Here again, two grain size classes are produced:

- **A fraction of <20 mm in the underflow**
- **A fraction of >20 mm in the overflow**

The overflow is conveyed to the heavy material of the wind sifter, and the underflow is conveyed to customer-provided containers for loading as fine grain after a magnet after removal of ferromagnetic materials.

LDPE PRODUCTION

A wind sifter separates film-type parts from the overflow of trommel screen, conveying it pneumatically to the light-material separator. The light material charged here is conveyed to the sorting cabin and is positively sorted there for interfering material on the sorting belts. The overflow of the sorting belt is transported to the bunker area and can be guided either to the bunker or, as an alternative by reversing a mechanical flap, to the bunker by a reversing belt.

The heavy material of the sifter can be sorted for contained recyclables such as buckets and cans on the sorting belts.

From the 222-327 mm fraction of the trommel screen film-type parts are separated by the wind sifter and are pneumatically conveyed to the light-material separator. The light material discharged here is positively post-cleaned by the NIR separator to upgrade the LDPE fraction.

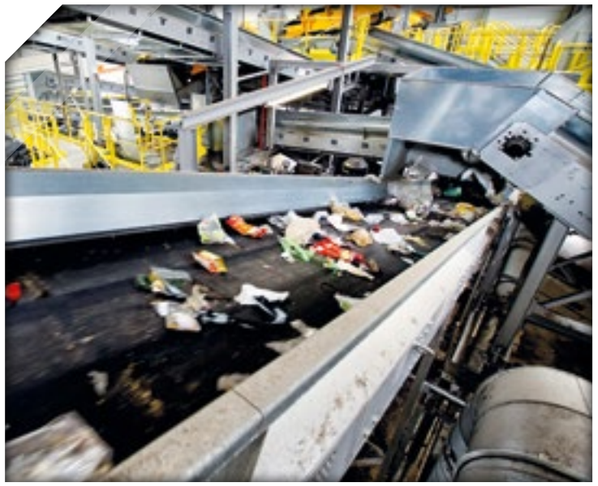
The later installation of another NIR separator can optionally be prepared to further improve the product quality. This optional NIR separator would then be operated negatively, i.e. interfering material would be discharged by a blow of compressed-air.
The LDPE product thus obtained is conveyed to the sorting cabin and is sorted there for interfering material on the sorting belt. The reversible belt conveys the overflow of the sorting belt to the bunker or the opposite bunker.

The heavy material of the sifter is conveyed into the trommel screen.

A wind sifter separates film-type parts from the overflow of trommel screen, conveying it pneumatically to the light-material separator.
The light material discharged here is positively post-cleaned by the NIR separator for upgrading LDPE. The product of this separator is now negatively post-cleaned on the downstream NIR separator a second time.
The LDPE product thus obtained is conveyed to the sorting cabin and is post-sorted there for interfering material on the sorting belt, if required. The reversible belt conveys the overflow of the sorting belt to the bunker or the opposite bunker.

MIXED POLYOLEFIN (MPO)

The non-LPDE materials of the four NIR separators as described above are conveyed to the MPO separator. Here, materials containing MPO are ejected in negative operation.
The MPO product thus obtained is conveyed to the sorting cabin and is post-sorted there for interfering material on the sorting belt, if required. The overflow of the sorting belt is conveyed to the MPO bunker or to the bunker by the reversing belt.
The wind sifter separates film-type parts from the overflow of trommel screen, conveying it pneumatically to the light-material separator.
The light material discharged here is positively post-cleaned by the NIR separator for upgrading MPO.
The MPO product thus obtained is conveyed to the sorting cabin and is post-sorted there for interfering material on the sorting belt, if required. The overflow of the sorting belt is conveyed to the MPO bunker or to the bunker by the reversing belt.
The non-MPO stream of the NIR separators is transported to the front of the PPK separator.
Other MPO fractions are obtained by the NIR separator from the light material of the ballistic separators as well as the ejection stream of the FKN post-cleaning separator. Materials containing MPO are positively blown out and are conveyed to the sorting cabin together with the MPO product of the separators. The passing material of separator is moved to the PPK separator.



TINPLATE PRODUCTION

The heavy material of the two medium-grain wind sifters is moved to the overbelt magnetic separators. These two magnets withdraw ferromagnetic parts and convey them to the post-cleaning magnet. Should the magnet fail, the belt will be reversed to eject the highly Fe-enriched material flow to a box. This above-mentioned post-treatment provides a significantly higher product purity in the tinplate fraction.

The passing material of the vibrating screen is conveyed to the overbelt permanent magnet.

The Fe product of the magnets is conveyed to the baling press and is there compacted to form marketable packages. These packages are conveyed to two customer-provided containers arranged one beside the other by a swivable and reversible apron conveyor for filling the containers optimally.
The passing material of the magnet is moved to the front of the separator.

PRODUCTION OF LIQUID CARTONS AND ALUMINIUM

The passing material of the magnets is moved to the NIR systems. Here, the liquid boards (FKN) are detected by near-infrared equipment and are discharged by a compressed-air blow in a targeted manner.
The product streams of these two separators are conveyed to the post-cleaning separator which then detects undesired parts and separates them from the product flow.
The passing material of the two FKN separators is conveyed to the parallel-arranged eddy-current separators. Here, the eddy-current equipment sorts out non-ferrous metals (mainly aluminium packagings), conveying them to the post-cleaning separator through a common product discharge belt. The NIR system is a longitudinally split separator unit.

In the conveying direction (left side) of the post-cleaning separator liquid boards are to be recovered from the product flow of the two eddy-current separators, which were not discharged by the FKN separator and typically reach the eddy-current separator product because of the aluminium barrier.
The product flows of the post-cleaning separator are conveyed to the sorting cabin and can be checked on the longitudinally split sorting belt manually before they come to the bunker area.
The discharge stream of the FKN post-cleaning is conveyed to the NIR separator.

PRODUCTION OF THE PP, PET, PE AND PS SINGLE SORTS

First of all, all four plastic single sorts are collectively detected in the passing material of the eddy-current separators for producing the PP, PE, PET and PS single sorts. This is done on the so-called collective polymer separators. Since their preliminary product stream contains too many film-type parts, the ballistic separators are installed downstream in every product flow. The light material of these two separators is transported to the front of the MPO cleaning separator.
The heavy material of the above-mentioned ballistic separators is conveyed to the separator which exclusively detects this type of plastics by NIR spectrometry and discharges it by a compressed-air blow in a targeted manner. From the product flow the ballistic separator again separates light parts which are conveyed to the sorting belt for manual post-cleaning of the MPO fraction. The heavy material of the ballistic separators is transported to the sorting cabin. There, it can also be checked manually on the split sorting belt and is then conveyed to the bunker area.
The passing material of the PP separator is fed to the PET separator which uses NIR spectrometry to detect this type of plastics and eject it by a compressed-air blow in a targeted manner. The product flow thus produced is divided into the two PET-bottle and PET-non-bottle fractions by the downstream NIR system. Both partial flows are guided into the sorting cabin. They can be checked manually on the sorting belt and are then conveyed to the bunker area.
The passing material of the above-mentioned PET separator is fed to the PE separator which uses NIR spectrometry to detect this type of plastics and eject it by a compressed-air blow in a targeted manner. The downstream wind sifter removes film-type parts from the product flow. This light material is pneumatically conveyed to the light-material separator, adding it to the LDPE fraction 140 220 mm on the sorting belt.
The heavy material is transported into the sorting cabin. It can be checked manually on the split sorting belt and is then guided to the bunker area.
The passing material of the PE separator is fed to the PS system which uses NIR spectrometry to exclusively detect this type of plastics and ejects it by a compressed-air blow in a targeted manner. The product flow runs into the sorting cabin. It can then be checked manually on the sorting belt and is then fed to the bunker area.
The passing material of the PS separator mainly consists of a mixture of plastics which still contains fractions of the single sorts which were not detected and separated by the upstream NIR systems. This material flow is combined with the heavy material of the ballistic separator and is further processed.

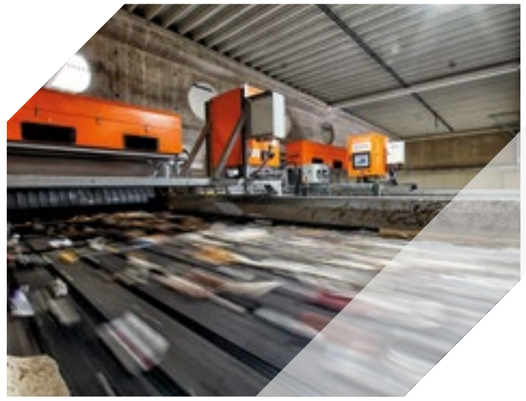
SORTING OF DIFFERENT RECYCABLES.

PRODUCING HEAVY MIXED PLASTICS

The passing material of the two separators is fed to the mixed plastics separator which uses NIR spectrometry to detect the remaining plastics and ejects it by a compressed-air blow in a targeted manner. Ballistic separator discharges flat parts from this material flow. Together with the light material of the ballistic separators, they are conveyed to the MPO post-cleaning separator. Since the heavy material of the ballistic separator still contains a fraction of high-quality single sorts, it is conveyed to the NIR system together with the passing material of the NIR separator. NIR systems which are used to compensate the discharging losses of the previous stages are called scavengers in the treatment technology. Thus, then detects PP, PET, PE and PS and discharges these materials in a targeted manner.
The product of this separator is conveyed to the front of the PP separator. The passing material of the separator forms the heavy mixed plastics fraction. It is guided to the sorting cabin via the sorting belt and is there post-sorted, if necessary, and then guided to a separate bunker.

PRODUCING PAPER AND CARDBOARD (PPK)

The passing material of the mixed plastics separator is guided to the PPK separator which uses NIR spectrometry to detect and separate paper, cardboard and carton.
The product flow of this NIR system arrives at the sorting cabin and can be checked on the right side of the longitudinally split sorting belt before it enters the pertaining bunker area.

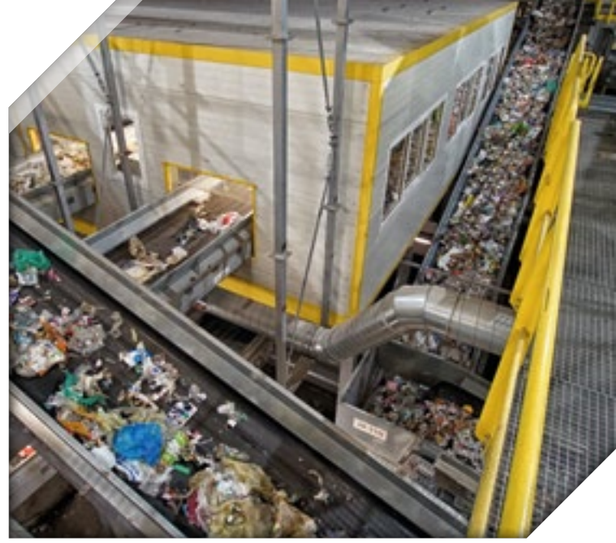


MINIMISING THE SORTING RESTS

Since no NIR system achieves a discharging rate of 100%, the passing material of the PPK separator still contains a certain fraction of recyclable materials. To recover them as well, a so-called scavenger is installed downstream in this place which can be programmed for different mixtures of recyclable material, depending on material quality and sorting targets. They are returned to the trommel screen via miscellaneous discharge belts.
The passing material of the scavenger provides a possibility of simply retrofitting the so-called blackscan separator to sort out black parts. The product and the material of this optional separator are then fed to the split sorting belt and can be checked there the last time before they enter the bunker area.
First of all, the place for manual sorting was established here to positively sort out potentially recyclable material which cannot be recovered by automated units.

CHECKING THE FRACTIONS IN THE SORTING CABIN

Except for tinplate and fine grain, all produced fractions are conveyed to the cabin via sorting belts and can there be checked manually and/or post-sorted.

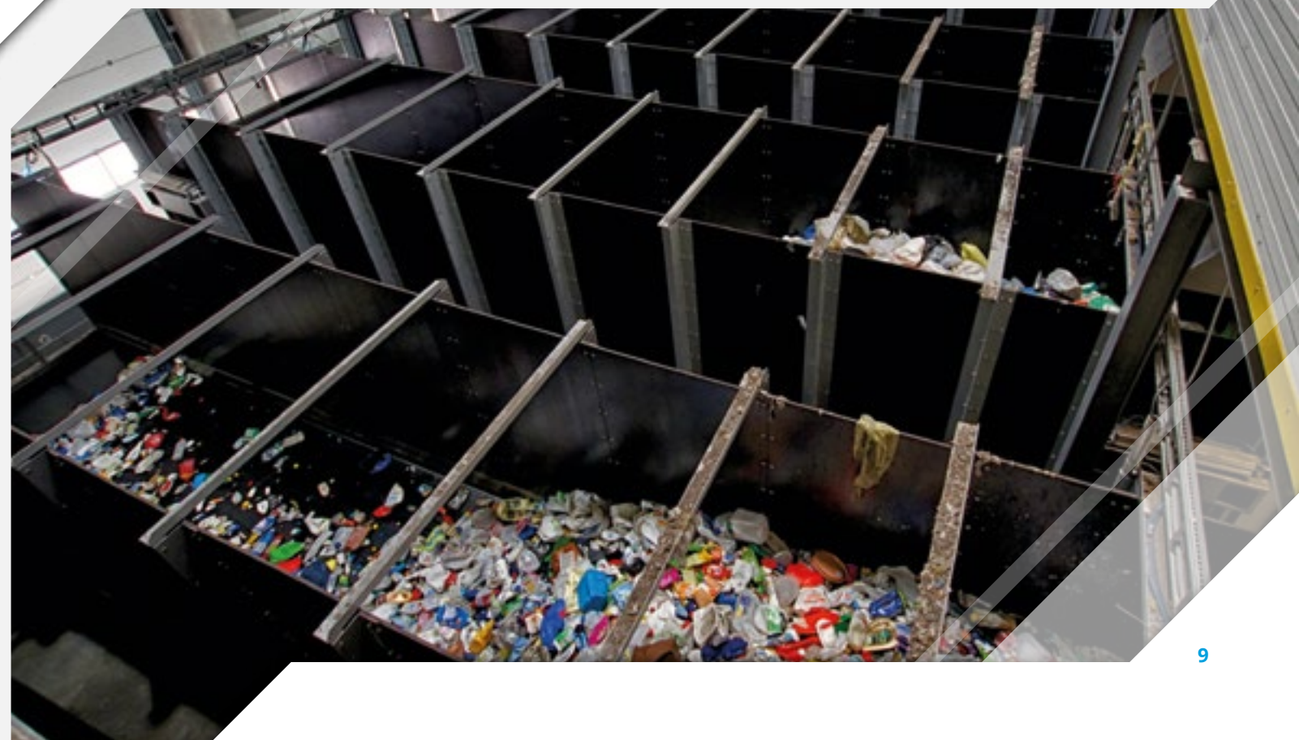


INTERMEDIATE BUFFERING IN BUNKER BELTS

Intermediate buffering is aimed at feeding the products separated by sorts to the channel baling presses in an alternating manner.
The bunker belts are arranged to form two sets between three chain belt conveyors. Thus, two chain belt conveyors can be selected by every bunker belt.

THE ASSIGNMENT OF THE BUNKER BELTS IS AS FOLLOWS:

C1-10 > film
C2-10 > MK film
(mixed plastics)
C1-20 > MPO
C2-20 > bucket/can
C1-30 > NE
C2-30 > FKN
C1-40 > PS
C2-40 > Rests
C1-50 > PE
C2-50 > PP
C1-50 > PE
C2-50 > PP
C1-60 > Free
C2-60 > PPK
C1-70 > PET bottle
C2-70 > PET shells
C1-80 > Rests/MK
C2-80 > MKS
C2-90 > black
(manual sorting)



COMPACTION/LOADING

Normally, the bunker belts feed material to the outer bunk belt conveyors. These two chain belt conveyors are each assigned to one of the above-mentioned channel baling presses.
The bunkers of Group C1 are fed to the compactor in normal operation.

In normal operation, the chain belt conveyors compactor feed material to the bunkers of Group C2. The material coming to the compactor have a movable perforator integrated in it to optimise the compaction of the certain materials.

The chain belt conveyor allows the contents of any bunkers to be fed to the customer-provided containers as loose bulk via section. To be able to feed optimised volumes to the box areas, the belts can be moved and reversed.

The fine grain fraction is loaded into a customer-provided container. Like the other upstream belts, the movable container charging belts have been designed such that the volume occurring during the time of a change of containers of approx. 20 min. can be buffered in it.

Since containers may not be pulled during the night, it may be necessary to buffer the quantities of material produced in the box area after removal of the container and to load them into the container the next morning with wheel loaders.

ALTERNATIVE OPERATIONS

To keep possibly interfering material out of the process (e.g. wet material after a trip of the extinguishing equipment), it is moved to the container under the transfer point. To this effect, the inclined conveyor can be reversed.
Depending on the requirements or the rate or the required quality, the NIR separator can also be operated negatively. This option was implemented by designing the discharge belt for a non-LDPE flow such that it can manually be moved crosswise.
Together with the heavy material of the sifter, the heavy material of the sifter can be moved into the sorting cabin by reversing the belt.
Depending on the requirement or the rate or quality, the NIR separator can also be operated negatively. This option was implemented here by the use of a manually adjustable flap in the NIR discharge hood.
As an alternative, the passing material of the separator can be moved as an MKS fraction to the sorting cabin together with the passing material of the polymer scavenger. This can be achieved by reversing the belt.
If the magnet fails, this material, which is then strongly ferromagnetic, can loosely be loaded into the Fe box for a short time by reversing the belt in this special case.
To avoid a shutdown of the plant in case of temporary failures of the packaging press, the Fe material can be moved to the customer-provided Fe container as a loose bulk by reversing the belt.

Contrary to the descriptions above in the subsection “Intermediate buffering in bunker belts”, the following bunker assignments can additionally be implemented as an alternative operation.

- **The LDPE >330 mm fraction can also be buffered in a homogenised manner together with the other LDPE fractions. This can be achieved by a reversible and movable design of the discharge belt. In addition, it is then possible to feed material alternatingly to the bunkers.**
- **Depending on the acceptance requirements, it may be necessary to buffer the MKS fraction together with the sorting rest fraction. This can be made possible by switching over the reversible discharge belt.**
- **If one of the two channel baling presses fails, the materials of the pertaining bunker group can be moved to the remaining compactor by reversing.**

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