MAS

Maschinen und Anlagenbau Schulz GmbH

Simply smart, double efficient: The MAS compact system for plastic recycling.

Dry recovery and Re-Compounding

MAS defines Re-Compounding:
economically and ecologically.

Versatile : Processing spectrum

Due to the versatile applicability, MAS compact systems are ideal for all impurities, which can be removed by friction, such as sand, soil or organic fibre contamination on:

- *stretch film*
- *agricultural film*
- *industrial film*
- *plastic fibres*
- *cups and thin walled hollow bodie*

These materials are re-compounded into high quality pellets.

Applications:

- *Film*
- *Pipes*
- *Profiles*
- *Sheets*
- *Injection moulding parts*

Multiple : Your benefits

The MAS compact system combines dry cleaning and extrusion with melt filtration and pelletizing. The advantages, provided:

- *a gentle process on the material*
- *cost savings of at least 50% per kg cleaned material compared to wet wash systems**
- *no water treatment system or operating permit required*
- *no additional waste treatment/ disposal costs for heavily contaminated water*
- *simple operation, low maintenance*
- *reliable plant operating process*
- *MAS extruder refines recycling goods into high-quality pellets*
- *low energy consumption using additional heat recovery system (up to 40% lower energy costs)*
- ***high profit margin due to increased efficiency***

Profitable : Homogenizing fillers, additives and pigments

- *Talc*
- *CaCo3, BaSo4*
- *Soot*
- *TiO2*
- *Colours*

** according to a comparative study incorporating empirical values*

The alternative to wet cleaning:
MAS compact systems.

Innovative : Technology

DRD (Double Rotor Disk) is a patented technology that cleans films and fibres without using water! It combines a cleaning centrifuge and thermal dryer in one machine and guarantees a clean, dry process that delivers consistently high end-product quality. Consequently, MAS compact systems clean plastic waste very efficiently, making them the pioneering alternative to wet systems in the recycling process.
The conical **co-rotating twin screw extruder from MAS** is ideal for compounding and recycling in one step, which **is called Re-Compounding.** The MAS patented **CDF filter** technology provides reliable and continuous melt filtration to separate paper, aluminium and wood.

Complete : Systems

MAS drying and cleaning systems consist of a single-shaft shredder, material storage facility, dry cleaning unit and conveyors. The material is temporarily stored in a silo. The plastic film flakes are then metered into the extruder volumetrically by a screw feeder. Alternatively the flakes can be fed gravimetrically, with the option to compound additives, improving the quality of the plastic. Downstream melt filtration removes the remaining impurities from the melt prior to entering the die head of the pelletiser. The plastic pellets are then dewatered and run through a centrifugal dryer. Significant energy saving is provided due to optional recovery of energy included in the pelletizing process water and by using a recuperator in order to re-use the warm air of the dryer exhaust stream.

MAS 75
(Example)

Why MAS compact systems
deliver the goods.

Practical : Maintenance

Clear design provides a unique coupling housing, which allows easy movement of the barrel for fast demounting of extrruder screws. Cleaning the processing unit, if required, or re-placing the mixing parts of the screws, is possible in a very short time.

Logical : Operation

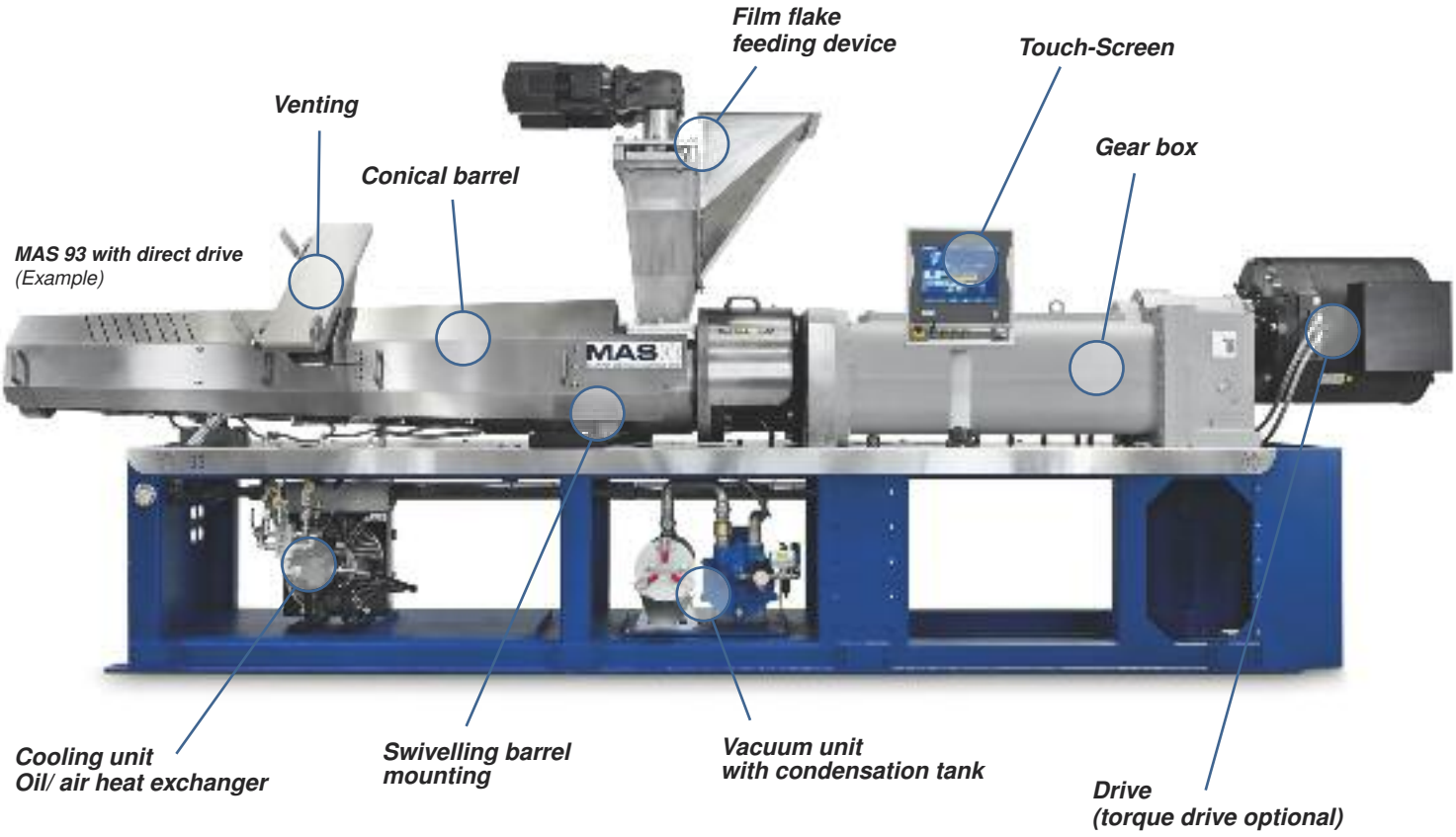
The control system, based on an industrial PC (1.6 GHz, 1 GB RAM) with touch screen panel, is simple and logical to operate. The system offers a wide range of functions, such as a formula storage, production and trend analyses, recording and storing of production data plus remote telephone maintenance.

Effective : Degassing

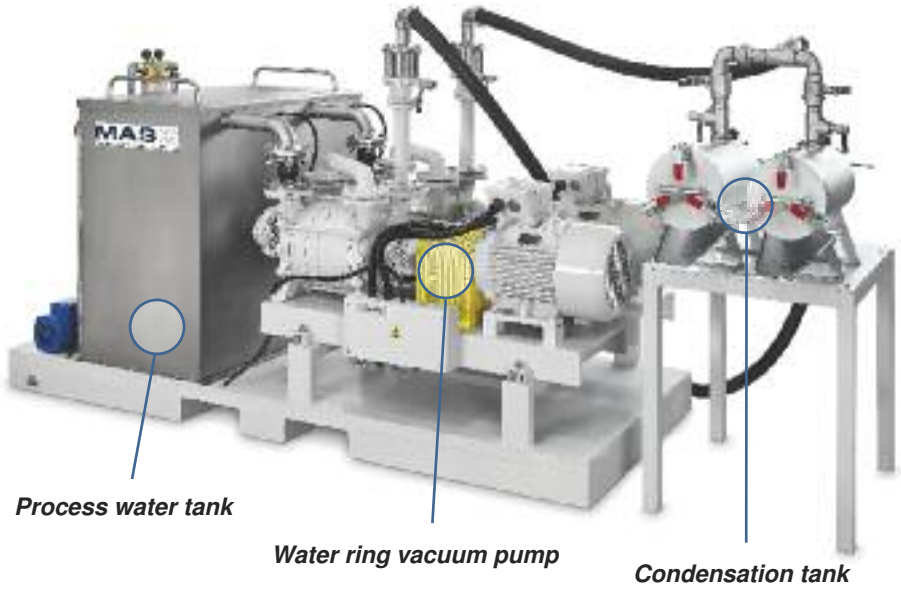
In recycling lots of materials tend to generate gases, when processed. Films in particular, but also adhesives, residual water and monomers release gases during the extrusion process. Tailor-made venting ports, exactly adjusted to each application and supported by an efficient double venting system, ensure a proper degassing of the melt. Furthermore, volutiles can be removed by additional degassing ports on the cascade extruder.

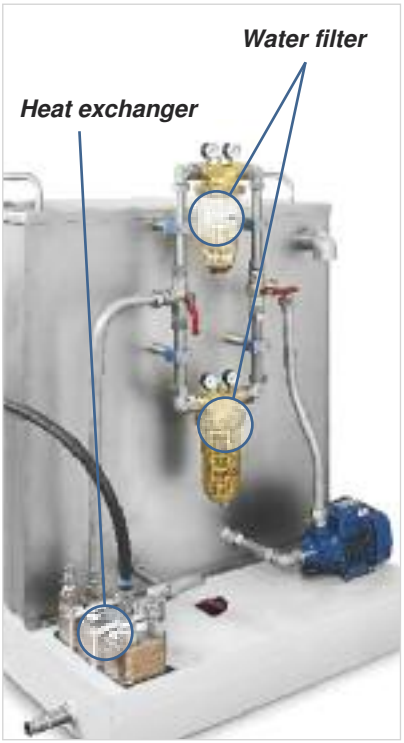
Individual : Configuration

The extruder screw consists of a rear part and an front part. Each is manufactured from one piece and is available in different pitch and flight design. Tailor made mixing and shearing elements are placed in between rear and front part. The barrel zones are equipped with heating elements and an air or liquid cooling on request.



Closed loop for process water of extruder venting, providing huge savings of water costs





MAS extruder:
Built for permanently high performance.

Perfect : Mechanics

Due to a robust mechanical engineering, MAS extruders have a particularly long service life and are easy to service. The conical design of the screw ensures minimal mechanical stress in the screw shaft, even at extremely high torques. The large intake zone centre-to-centre distances enable the use of maximum-sized drive shafts. The back-pressure bearings are also generously dimensioned. The compact design of the MAS extruder ensures a very small footprint.

Optimized : Performance

Excellent process characteristics of MAS extruders are provided by the huge material intake volume and high overlapping of the screw flights. Due to the conical design of the processing unit, the intake volume is significantly bigger than the discharge volume, resulting in a very high screw filling level. The melting zone is specified by an exceptionally large inner/outer diameter ratio. Consequently, MAS extruders offer an outstanding homogenization and mixing performance. High discharge rates can therefore be achieved even at low screw speed, providing high melt pressures at low melt temperatures.

Robust : Material and design

Premium quality steel, robust design and quality workmanship guarantee high availability and a long life time. Barrels are made of tool steel or nitrided, with the screws being hardened, nitrided and armoured. Depending on the application the process unit is optionally provided in higher wear resistance.

Impressive : melt pressure built up

The conical screw design allows high and stable melt pressure built up, supported by the well designed geometry of the discharge section and robust, large back pressure bearings with a minimum service life of 40,000 hours, calculated at a pressure of 250 bar.

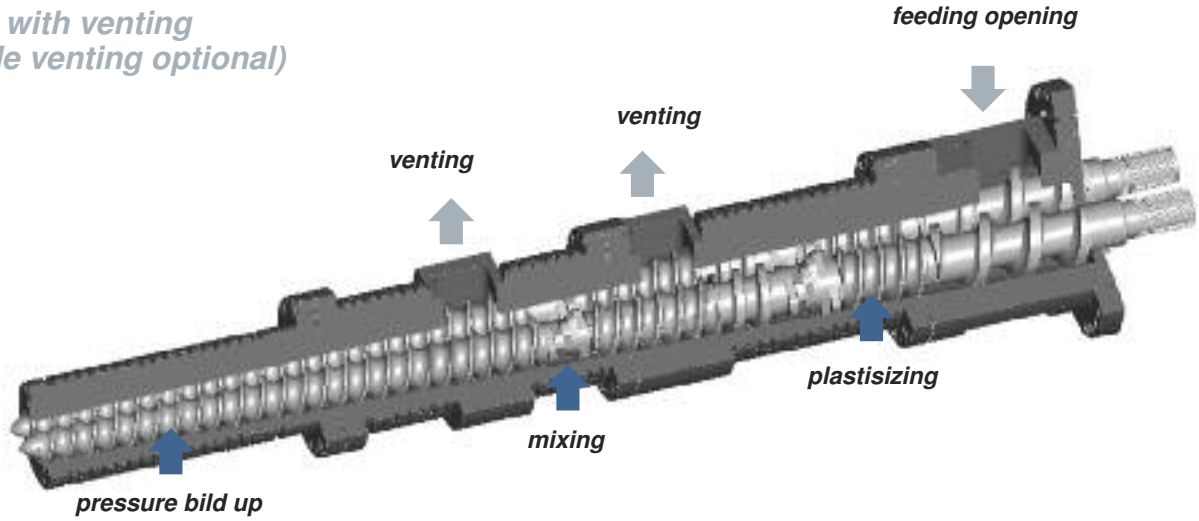
Wear resistance

MAS material code	*Steel quality*	*Wear resistance*	*Corrosion*
Barrel			
M101	Nitrided steel	++	++
M503	Tool steel, hardened nitrited	+++	+++
M352	Tempered steel with tool steel bush	++++	++++
M370	Tempered steel coated with tungston carbid	+++++	+++++
M392	PM, hardened	+++++	+++++
Screws			
M161	Nitrided steel (flights clad with stelite 1, 6 or 12)	+++	++
M370	Tempered steel coated with tungston carbid	+++++	++++
M392	PM, hardened	+++++	+++++

\+ light +++++ very strong

MAS 93-K with CDF 500-D for throughputs up to 1.600 kg/h

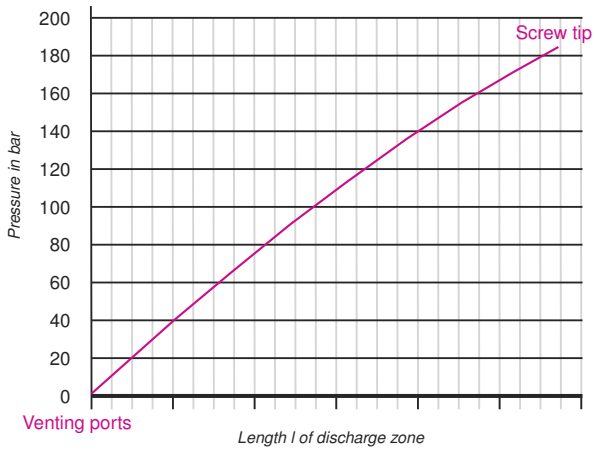
Barrel with venting (double venting optional)



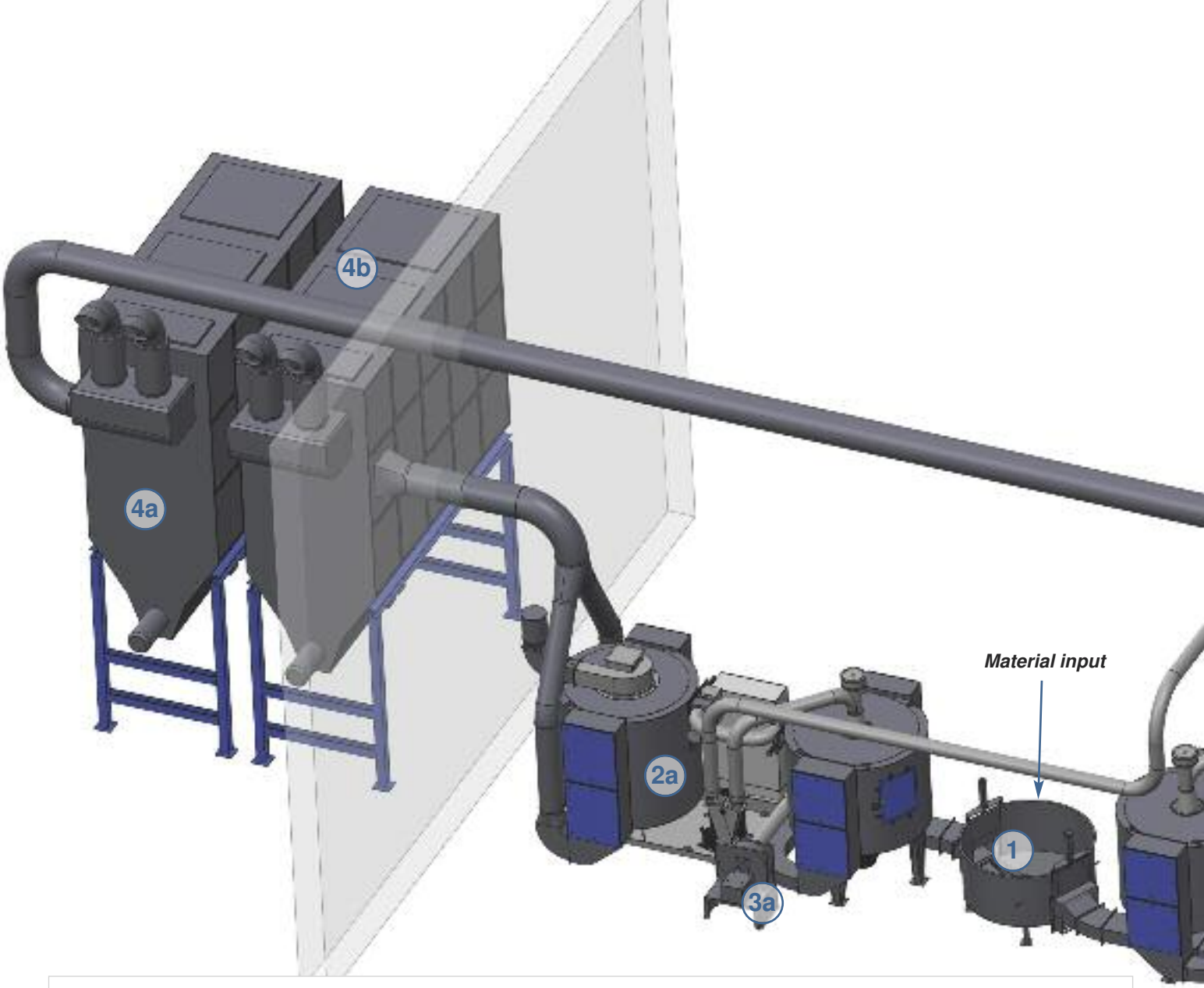
Schematic

Barrel with bush M352

Melt pressure in barrel



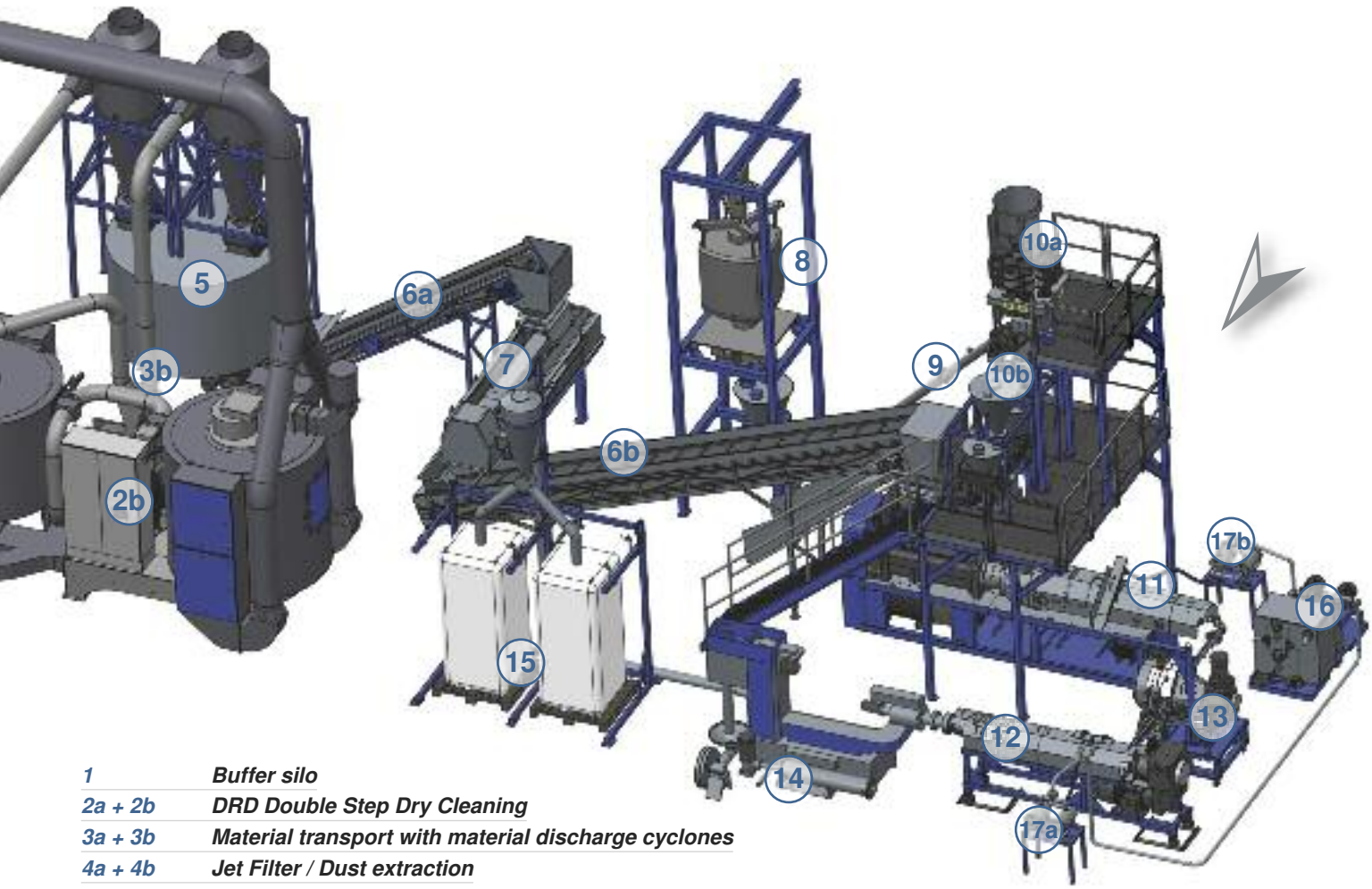
Pressure profile MAS 55L for a mass throughput of 500 kg/h, 270 rpm


4b
4a
2a
Material input
1
3a

Re-Compounding with MAS

Re-Compound and tailor your pellet with the extremely efficient MAS Extruder

Smart : *Recycling and Compounding in one step*



1	***Buffer silo***
2a + 2b	***DRD Double Step Dry Cleaning***
3a + 3b	***Material transport with material discharge cyclones***
4a + 4b	***Jet Filter / Dust extraction***
5	***Intermediate silo***
6a + 6b	***conveyor belt***
7	***Gravimetric dozing belt***
8	***Big Bag loading station***
9	***Auger screw***
10a + 10b	***Gravimetric dozing units***
11	***MAS Extruder***
12	***CDF Melt Filter***
13	***Cascade extruder***
14	***Pelletizing unit***
15	***Big Bag filling station***
16	***Closed loop for process water of vacuum systems***
17a + 17b	***Condensation tanks of vacuum systems***

CDF 500-D
(Example)

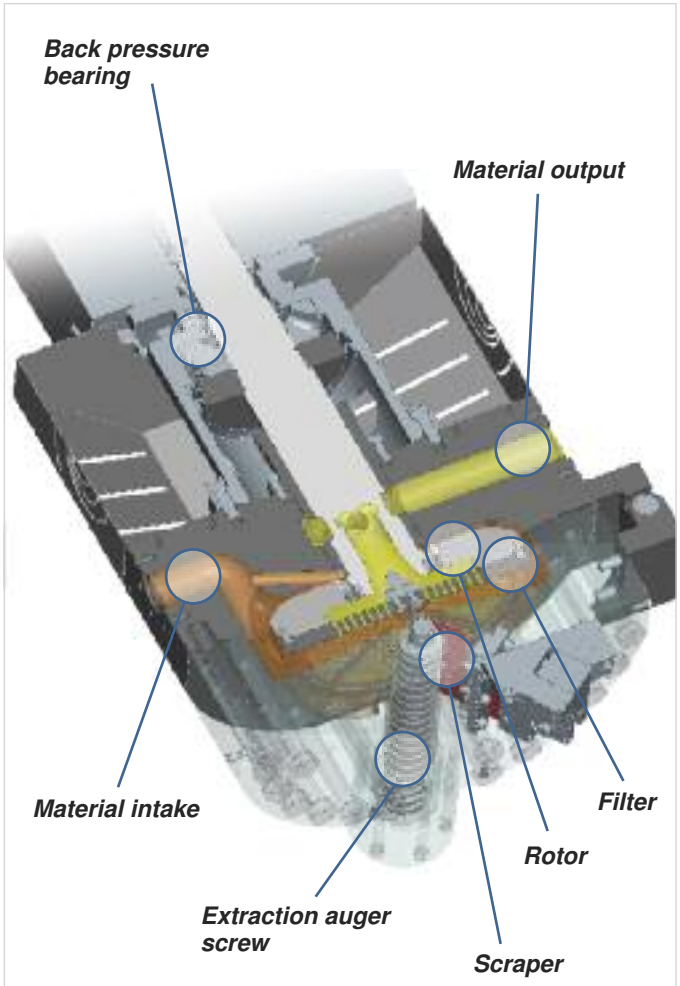
The CDF filters types from MAS

Typ	CDF 300	CDF 300-D	CDF 500	CDF 500-D
Ø Filter	1 x 300 mm	2 x 300 mm	1 x 510 mm	2 x 510 mm
Filtration surface	706 cm²	1.384 cm²	1.830 cm²	3.650 cm²
Filtration fineness	100 - 750 µm	100 - 750 µm	100 - 750 µm	100 - 750 µm
Max. melt pressure	180 bar	180 bar	180 bar	180 bar
Max. pressure difference	150 bar	150 bar	150 bar	150 bar
Throughput capacity	300 - 700 kg/h	700 - 1.600 kg/h	700 - 1.600 kg/h	1.300 - 2.000 kg/h

The MAS melt filter
ensures constant filtration quality.

Continuous : Melt filtration

Wood and paper are very common impurities in plastic recycling. Conventional filter systems using mesh screens are usually unable to cope with even small amounts of such impurities. The continuous CDF-type melt filter separates contamination such as paper, wood, aluminum or rubber efficiently. A scrapper removes the contamination from the surface of a rotating screen disc. The impurities are discharged continuously from the CDF, while the filtrated melt is forwarded to the pelletizing system. The melt pressure in front of the filtration disc controls automatically the function of the Scraper.



Schematic

Easy maintenance : Filter disc replacement

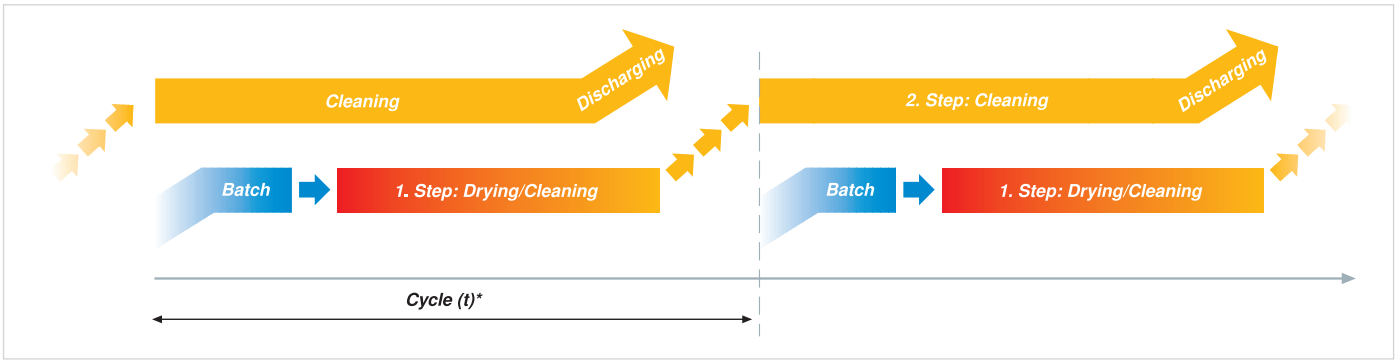
The filter discs are manufactured from hardened steel with hole sizes from 100 µm up to 750 µm. Replacement is very simple as the filter screen is freely accessible once the split housing has been opened. Consequently, the filter screen can be replaced quickly using conventional tools.

CDF Filter shown with cover opened

Discharge of contamination

How the MAS Dry-Cleaning-System
cleans up in performance.

DRD 18 DS
(Example)

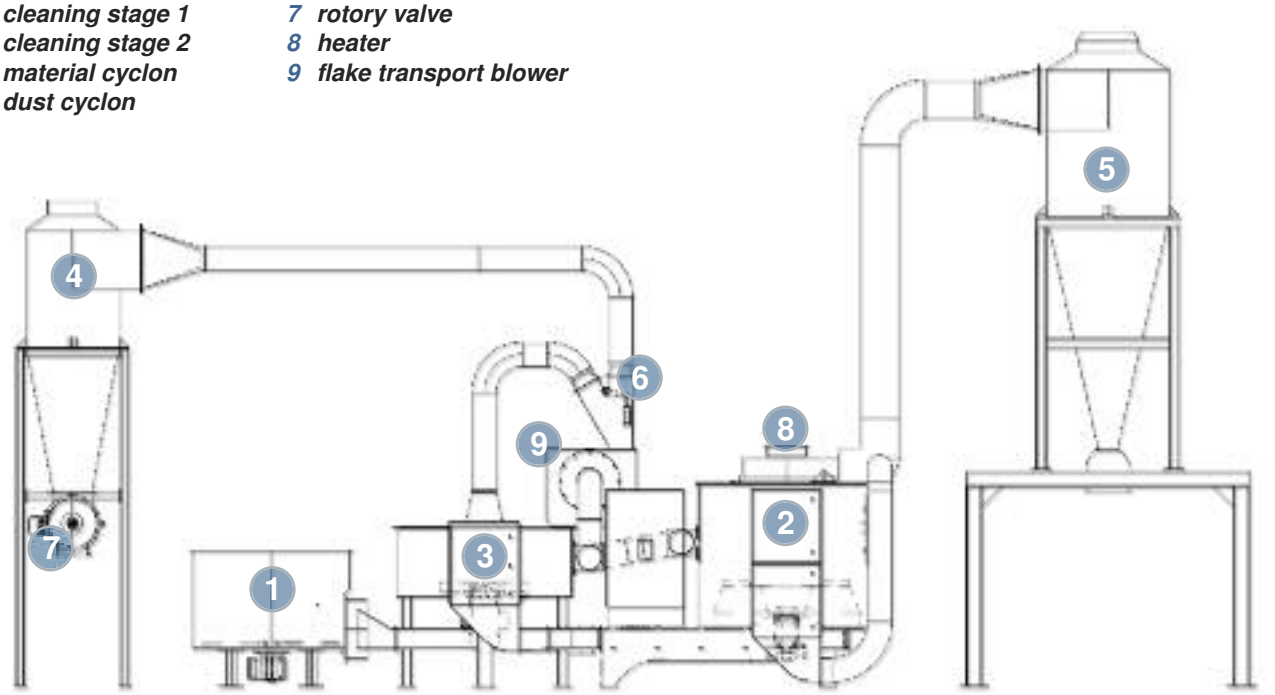


Reliable : *Dry- Cleaning process*

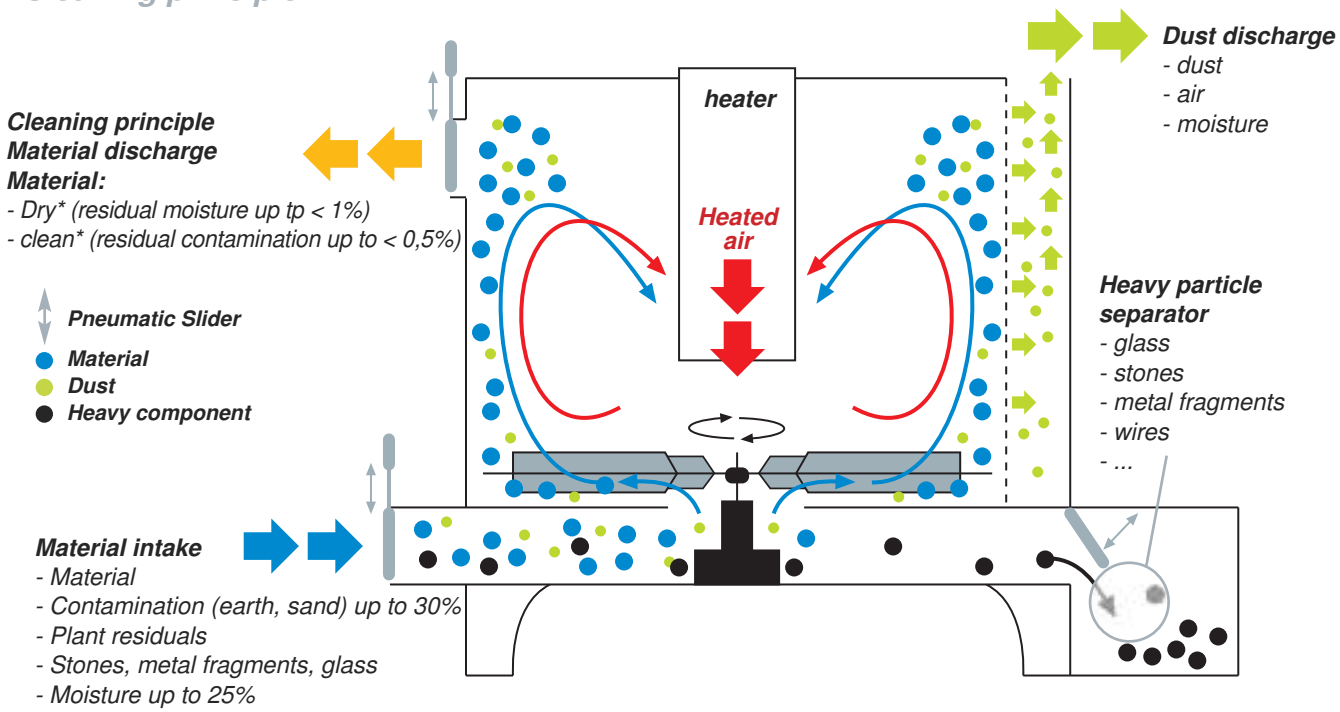
After the plastic waste is shredded, the dry cleaning unit is continually fed from the buffer silo with batches weighing up to approx. 30 kg. The cleaning process is completely dry, based on the well proven DRD system: The plastic material rotates in a cylindrical chamber, is engulfed in hot air and kept in suspension. The turbulent airflow ensures an excellent drying effect. At the same time, impurities such as sand, soil, or fibres are separated by the screens.
The pre- cleaned flakes are then discharged and transported automatically into a second cleaning chamber to remove remaining impurities. High speeds and large air quantities ensure separation of fine dust particles. Both cleaning cycles run parallel, fully automatically controlled, substantially increasing the performance of the overall system.

Schematic

1 *intermediate storage*
2 *cleaning stage 1*
3 *cleaning stage 2*
4 *material cyclon*
5 *dust cyclon*
6 *diverter valve*
7 *rotory valve*
8 *heater*
9 *flake transport blower*



Cleaning principle



Residual moisture and contamination depend on specification and condition of the input material

MAS compact systems
offer numerous additional benefits.

Stable : Operation

An easy-to-operate SPS controls MAS drying and cleaning systems fully automatically. Heating power and retention times can be adjusted in accordance with moisture content and the degree of contamination. The process is controlled automatically, depending on the moisture content of the input material.

A DRD-Dry-Cleaner, installed in a complete recycling process, offers major benefits:

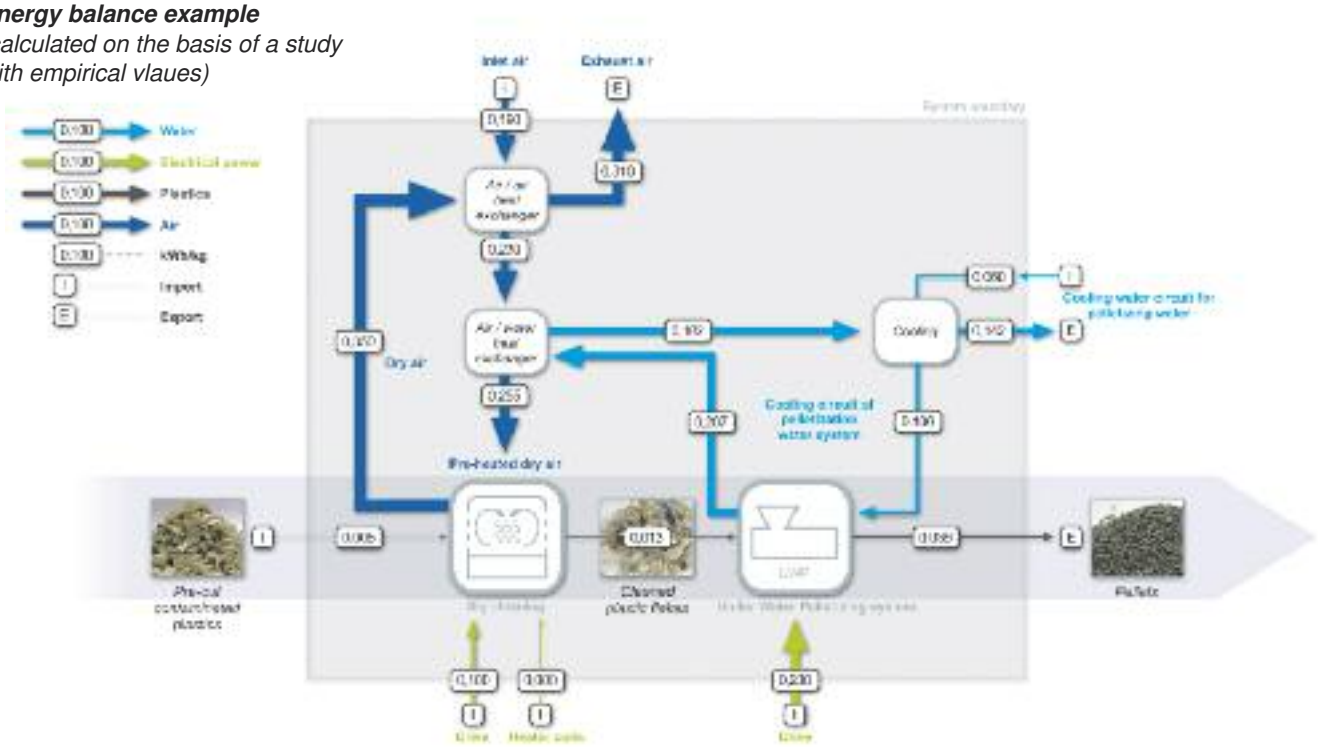
- *higher extruder throughput due to preheated input material*
- *stable extrusion process because of low residual moisture content*
- *improved pellet quality due to constant flake properties*
- *longer life time of melt filtration screens*
- *longer extruder screw and barrel service life*
- *high energy savings because of re- use of heat inside pelletizing process water and exhaust air of the DRD*
- *environmental friendly process as only air is used for cleaning*

smart : Energy concept

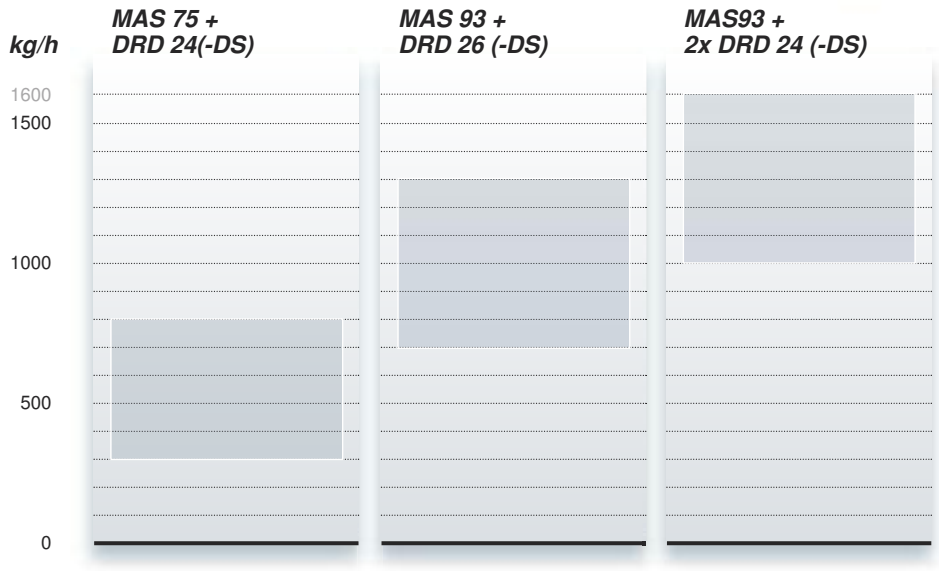
Energy consumption is kept extremely low by re-using the energy of the pelletizing process water and the heat implied in the exhaust air of the DRD.

JET Filter
(Example)

Energy balance example
(calculated on the basis of a study with empirical vlaues)



MAS 93
(Example)



Throughput rates are dependent on moisture level and material characteristics as well as type and amount of contamination

MAS

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