



# POULTRY MANURE DRYER

POLLO POULTRY MANURE DRYER FOR THE (SUB) TROPICAL CLIMATE

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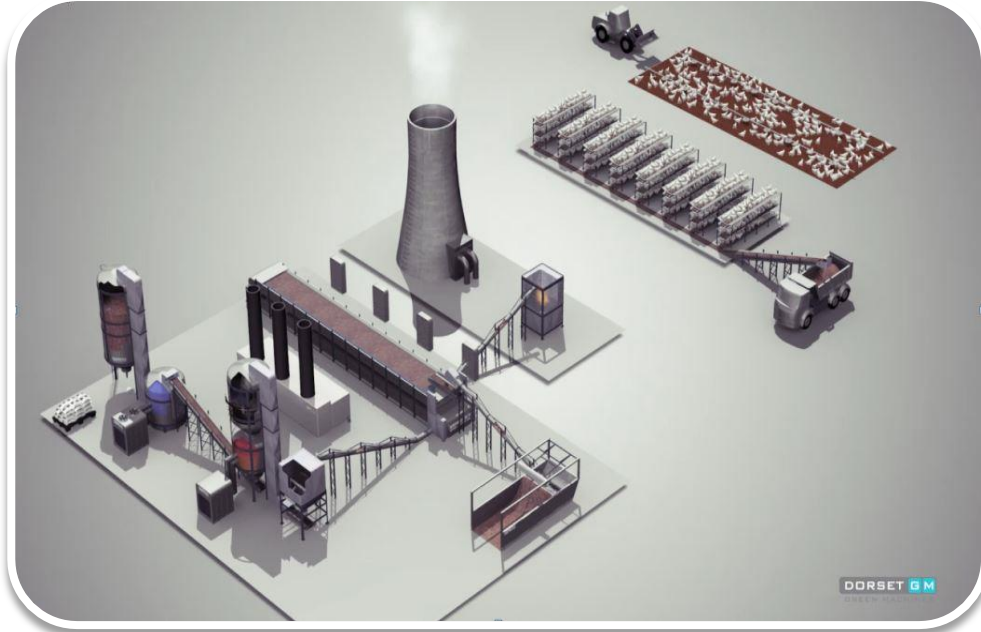
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# ANIMATION



Click on the picture on the left or on the link below to open a short animation video about the poultry manure drying system:

<https://youtu.be/UQIWNiTH120>

# INTRODUCTION

This document describes how the Dorset poultry manure drying plant has been designed for use in (sub) tropical climates and how it functions.

The goal of the manure plant is to turn poultry manure into a more valuable product. The manure will be dried to a dry matter content of 85-88%.

Poultry manure can be dried using hot air. Outside air or farmhouse air can be used during the dry period. During the wet monsoon season the outside air and farmhouse air are not hot enough and the air needs to be heated up using external heat sources.

With this system it is possible to dry, pelletize and sanitize the poultry manure in a period of maximum 3 days.



# WHY PROCESS MANURE INTO ORGANIC FERTILIZER

## Adding value

- Transformation into organic fertilizer
- Fuel for producing electricity



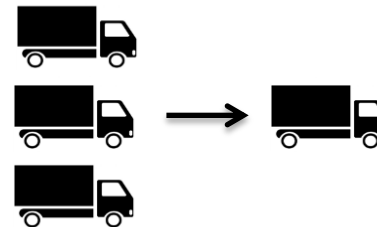
## Advantages compared conventional composting

- Less ammonia
- Less smell
- Higher value of end product
- End product occupies less (storage) space
- Total process takes less than 3 days
- Biosecurity: Safe organic fertilizer for human food production through sanitation



## Lower transport costs

- Reduced weight
- Reduced volume



# END PRODUCT

## CENTRALIZED PRODUCTION OF ORGANIC FERTILIZER FROM LAYER MANURE

**Day 1:** Collecting wet manure from the farmhouse by truck

**Day 2:** Drying of the manure

**Day 3:** Pelletizing, sanitation and packing

**Day 4:** Storage or transport of safe end-product (bio-security)



**Organic fertilizer pellets for sale within 3 days!**

# END PRODUCT

## END PRODUCT WHEN USING A POLLO DRYER

The dry material from layer manure are a base fertilization for various crops, special fruits and vegetables. The organic pellets contain a high percentage of organic matter and many essential trace elements like Fe, Mn, B, Mo Zn, Cu.

Typical content\*:

|                |       |
|----------------|-------|
| Dry matter     | 90 %  |
| Organic matter | 65 %  |
| N-total        | 4,0 % |
| N-org          | 3,6 % |
| P2O5           | 2,5 % |
| K2O            | 2,3 % |
| MgO            | 1,1 % |
| CaO            | 9,3 % |
| pH             | 7     |

\*Depending on the input

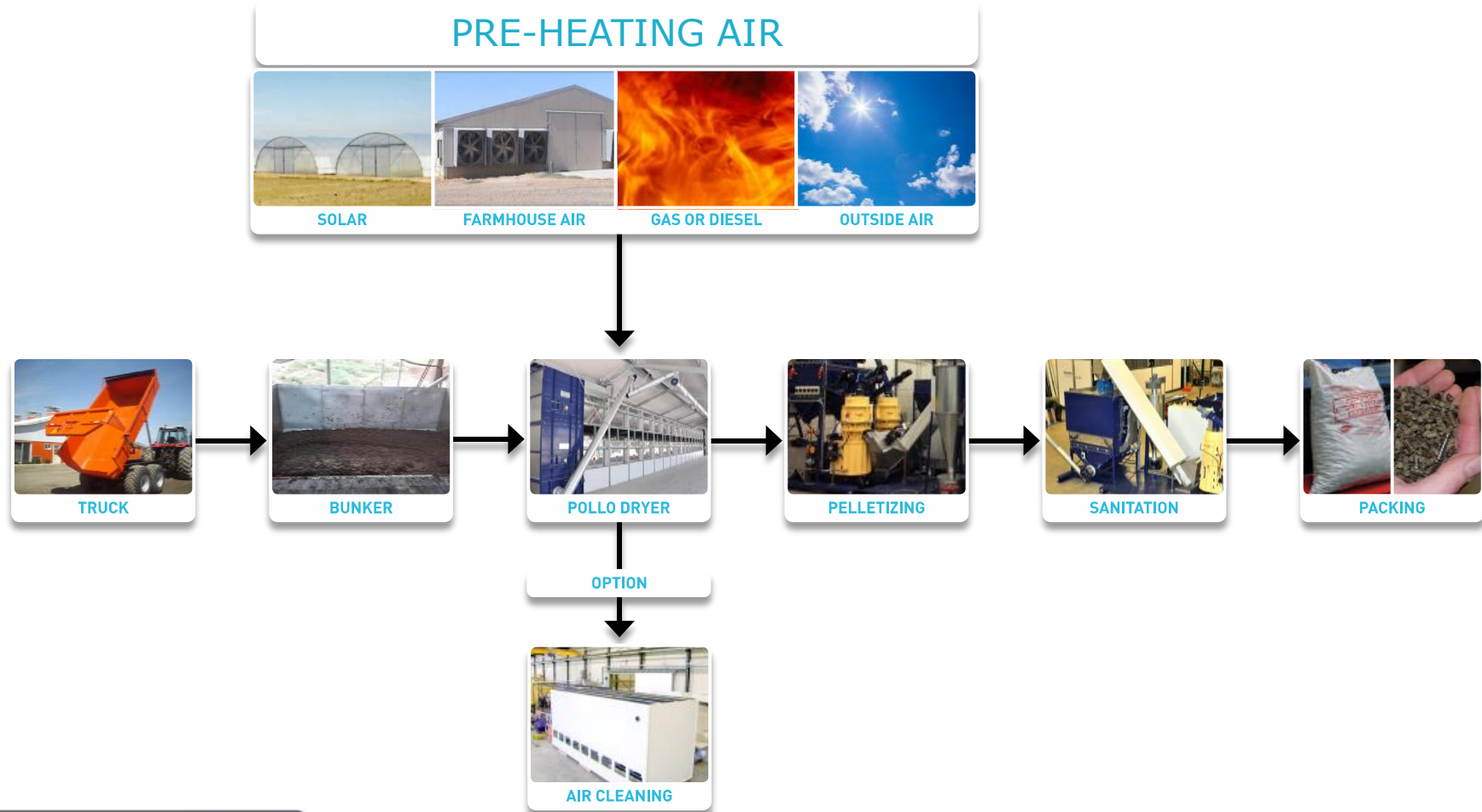


| Crops                 | Amount        | Dimensions      |
|-----------------------|---------------|-----------------|
| Grapes                | 1.500 – 2.300 | kg per hectare  |
| Almonds               | 3 – 6         | kg per tree     |
| Citrus                | 1.200 – 1.500 | kg per hectare  |
| Flowers               | 250 – 300     | gramme per m2   |
| Strawberries          | 2.000 – 2.500 | kg per hectare  |
| Fruit trees           | 1.000 – 1.200 | kg per hectare  |
| Potatoes              | 2.000         | kg per hectare  |
| Sprouts / cauliflower | 1.500 – 2.500 | kg per hectare  |
| Cucumbers             | 1.500 – 2.000 | kg per hectare  |
| Peppers               | 2.000 – 3.000 | kg per hectare  |
| Carrots               | 1.500 – 2.000 | kg per hectare  |
| Other vegetables      | 1.500 – 3.000 | kg per hectare  |
| Tobacco               | 1.800         | kg per hectare  |
| Melons                | 2.000 – 2.500 | kg per hectare  |
| Lawn                  | 2.000 – 2.500 | kg per hectare  |
| Grapes                | 200 - 300     | gramme per vine |

- The pellets are used for a wide variety of crops
- The right quantity for use depends on local conditions of the soil (organic matter, soil structure), the crop, the climate and application methods. The given figures are an indication
- It's important to adapt the usage by young crops.
- Sufficient water for the breakdown of the pellet is important so that the nutrients are available when the crops need the nutrients.
- It is to be recommended to apply the pellets to the soil on or two weeks before to plant or to sow.
- Dependent on the needs of the crops, more (smaller) gifts of pellets during the growing season is recommendable.
- The pellets can be applied with a fertilizer spreader or drill fertilizer or manually.

# PRODUCT FLOW

## PRODUCT FLOW 3 DAYS



# INPUT SYSTEM FOR EXTREMELY WET MANURE

## THE HK-MIXER - INPUT SYSTEM FOR DRY MATTER PERCENTAGES BELOW 30%

In case of manure with a low dry matter percentage, Dorset can offer a wet manure input system.

### Working principle

Wet manure from the house can be dumped in a bunker by a truck or belt. A frequency controlled auger transports the wet manure to the HK-mixer. Dry end-product is also supplied to the HK-mixer by the back-mixing unit. In the HK-mixer dry and wet product will be mixed and the product becomes suitable for use in the Pollo dryer.

### Capacity

Up to 30% of the dried end product can be used for back mixing.  
Maximum capacity is 10 m<sup>3</sup> mixed product per hour.



*Back-mix unit, HK mixer and conveyor belt to Pollo dryer*

### Back-mix unit:

The back-mix unit will transport a small amount of dried product back to the HK mixer, where it will be mixed with wet product. On the following page you will find a product flow of the HK mixer input system.



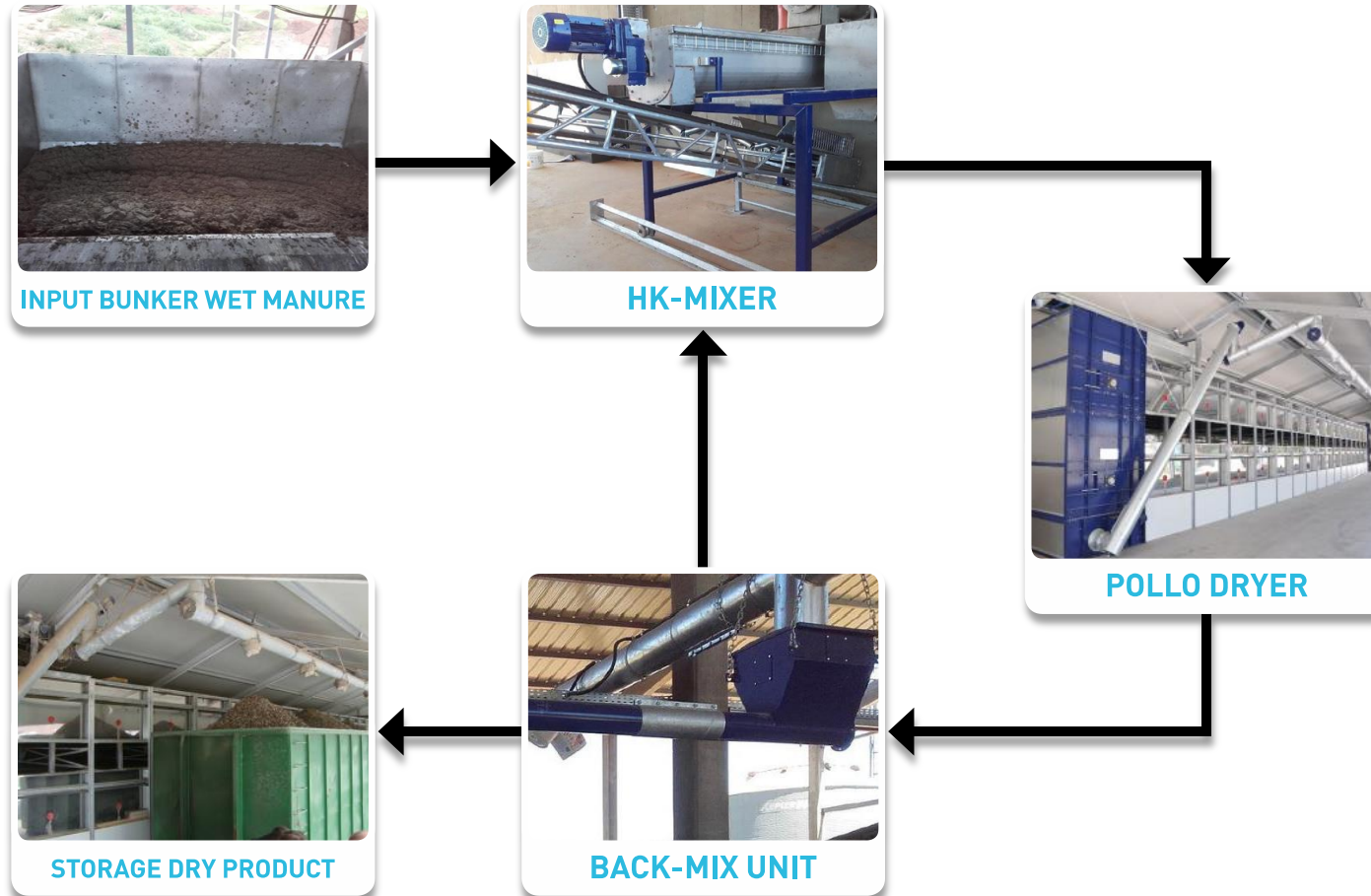
*Wet manure in the bunker*



*Mixed wet and dry manure on the conveyor belt to the Pollo dryer*

# INPUT SYSTEM FOR EXTREMELY WET MANURE

## HK-MIXER PRODUCT FLOW



# PRE-HEATING AIR



*Farmhouse air*



*Air pre-heated by burners*



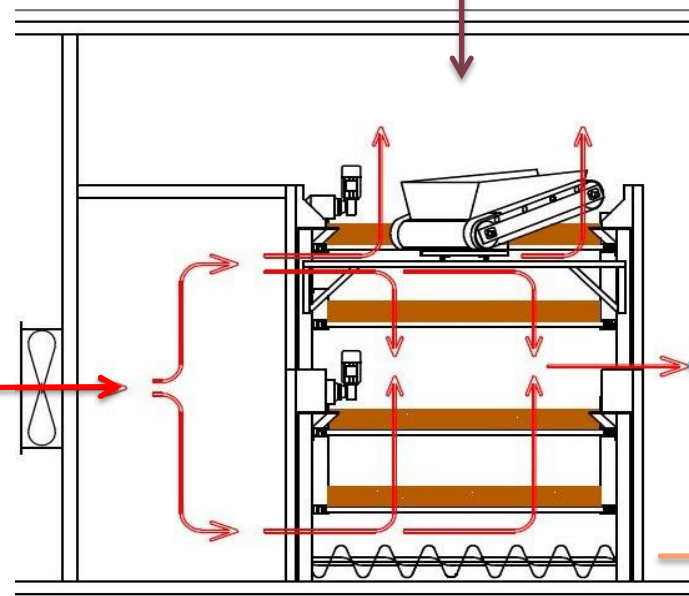
*Air pre-heated by solar energy*



*Outside air*



*Wet chicken manure*



*Outside air*



*Dry chicken manure*

# PRE-HEATING AIR

## CLIMATE CONDITIONS

In moderate climates like European, USA and Middle East countries the air from the farmhouse can be used for drying of the manure within 2 days.

In (sub) tropical areas pad cooling gives high humidity to the exhaust air from the house. In the dry season the outside air could be used to dry the manure.

During the monsoon period with high temperature and humidity the air needs to be heated up to maintain drying performance.

## Pre-heating using solar energy

One possibility is to pre-heat the outside air by using plastic tunnels (greenhouse).

Heating up the air by using sunlight is done by passing the air through a foil green house. The green house 'catches' the heat, and the air passes through and is heated up. This is a simple and environment friendly system and can be very effective in sunny conditions.

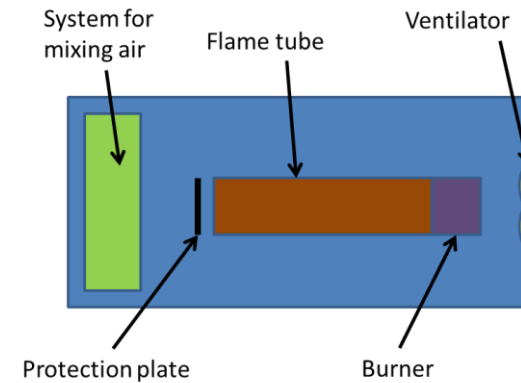


# PRE-HEATING AIR

## Pre-heating using burners

A second possibility is to add fuel such as (bio)gas, diesel, woodchips or poultry manure and heat up the air to 100° C.

| GAS / DIESEL BURNER |   |
|---------------------|---|
| <b>Construction</b> | Built in a 20ft-container, ready for transport  |
| <b>Fuel</b>         | low-sulphur diesel (0.2% sulphur) or (propane) gas  |
| <b>Principle</b>    | Air is heated directly, burning fumes are combined with air   |
| <b>Operation</b>    | The burner has 3 temperature set points, based on the ambient conditions (temperature and humidity) the operator determines which set point to use. |
| <b>Air supply</b>   | The burner is equipped with a fan that supplies enough air to feed the dryer.   |



# POLLO DRYER

## THE DRYER IN GENERAL

The Dryer dries the manure from 18% to 95% dry matter content.

The Dorset dryer is a plate belt dryer. This means that the dryer has many perforated plates on which the wet product moves through the dryer while being dried.

The drying process is a batch process. The installation operates fully automatic 24/7 without direct supervision.



## Advantages of the Dorset dryer

- Low energy consumption;
- Highly compact and flexible;
- Requires little maintenance
- Fully automatic operation without supervision is possible;
- Manure can be dried without intermediate treatment;

# POLLO DRYER

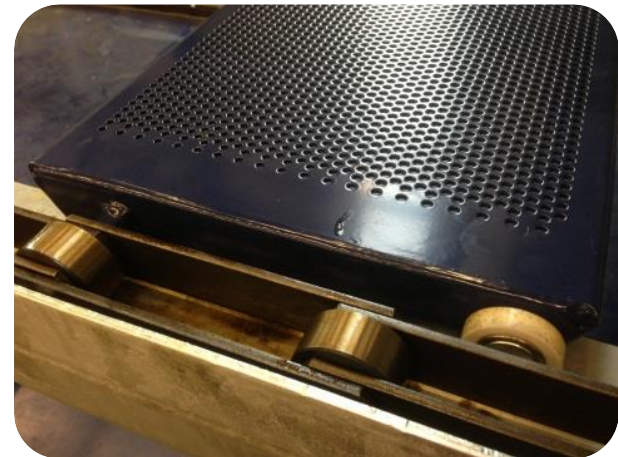
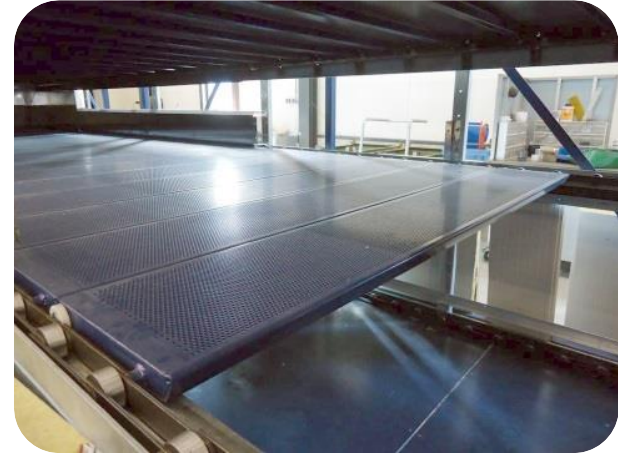
## THE DRYING BELT

The Dorset drying system uses plate belts. These belts consist of perforated steel plates that are linked to one another. The steel plates are pulled around by a roller chain.

Dispensing the manure starts on the top layer, after which the product is transported through the dryer by the plate-belt. During this process, warm air is pulled or pushed through the plates and product.

The plates have been galvanized and powder-coated, in order to provide sufficient protection against aggressive substances. The belt is made of steel plates and therefore can carry a thick layer of product on top. A thick layer (15-20cm) of product is important for drying efficiency.

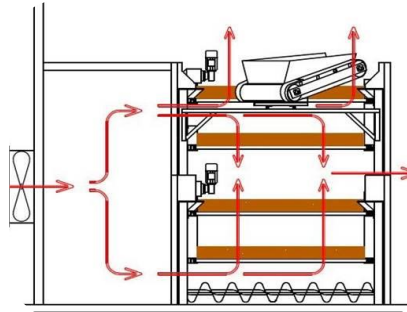
If the system is operated properly, the steel plates will not require cleaning. Neither do they need replacement or other service during the lifetime of the drying system.



# POLLO DRYER



*The Dorset drying system is a plate belt dryer. The dryer consists of long belts made of perforated steel plates that are linked to one another.*



*The wet product is being dried as it lies on a perforated plated belt and the water is evaporated while hot air is pulled or pushed through the belt and the product.*



*The wet material gently dosed on the belt by a short conveyor belt. The belt moves back and forth, spreading the material evenly on the plated dryer belt.*



*The hot air, used for the drying process is outside air, air coming from the poultry houses and pre-heated air coming from a solar greenhouse or burner.*



*The plated belt transports the material through the dryer. When the material reaches the end of the belt, it is dropped on the plates below and continues to move through the dryer.*



*When the material reaches the end of the lowest belt of the dryer, it is dry and transport screws transport it onwards to the end storage for further processing.*

# INTAKE BUNKERS

Dorset offers different types and sizes of intake bunkers, each of them designed for a specific purpose to meet your specific requirements.



*Oblique bunker 8m<sup>3</sup>*



*Steel intake bunker  
27 - 54 m<sup>3</sup>*



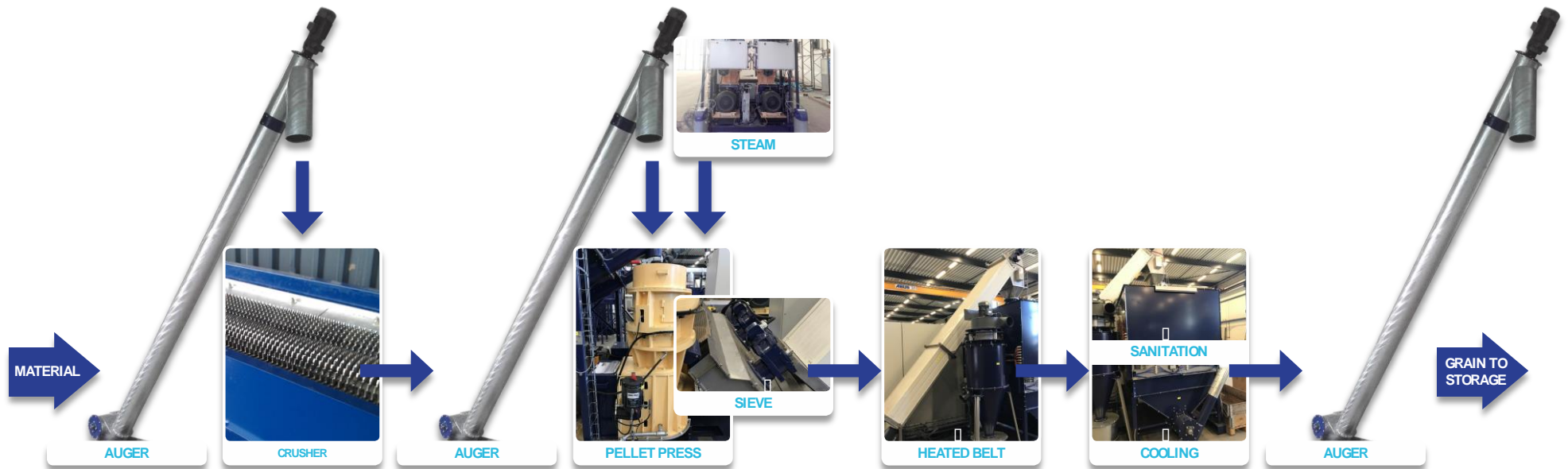
*Toploader 20 - 30m<sup>3</sup>*



*Concrete bunker: low  
budget intake bunker*

# ORGANIC FERTILIZER PELLETIZING PLANT

## PRODUCT FLOW



# ORGANIC FERTILIZER PELLETIZING PLANT

## ORGANIC FERTILIZER PELLETIZING PLANT

Dorset provides a complete system with all equipment to have pellets produced from sludge on a semi-automated procedure.

Pelletizing greatly reduce volume and thus reduce transport and storage costs. The pelletizing plant also provides new marketing opportunities to sell the end product.

The dried product with about 82 to 85% dry matter content is stored in a bunker. Then the material is minimized in a crusher after which a mixing screw conveyor (frequency controlled) transfers the material onward to the press. If the material is dry, steam can be added here.

Further the pellet is cooled and hardened in the cooler by drying with air. Dust is removed from the air by a cyclone.

The pelletizing plant consists of the following parts:

- Intake bunker
- Crusher and augers
- Screw conveyor
- Pellet press
- Cooler with dust removal by cyclone
- Special sieve for removing fine dust
- Sanitation (Bio-security)
- Steam injection (option)
- Metal magnet (option)



*Intake bunker 48 m3*



*Pelletizing plant 800 kg/hour*



*Pelletized end product*



*Pelletizing plant equipped with steam unit*

# ORGANIC FERTILIZER PELLETIZING PLANT

## **SANITATION (BIO-SECURITY)**

Dried poultry manure which has been pelletized can go through a sanitation process. By doing this, harmful bacteria and pathogens will be killed. When this process has been performed, the pellets are sanitized and can subsequently be exported. There are, however, regulations which stipulates certain requirements before this can be done. The Dorset sanitation unit fulfills the requirements for sanitation of pellets.



*The Dorset sanitation unit consists of a rotary valve, the sanitation unit itself (including heating, high level sensor) and a pellet outlet at the bottom. Product is supplied to the sanitation by means of a heated belt.*

# ORGANIC FERTILIZER PELLETIZING PLANT

## DATA LOGGING

Dorset has set up a test protocol to measure the temperature and residence time in the sanitation unit. By using a ball equipped with a temperature sensor and a location (RTLS) sensor, the temperature is logged over the period of time when the ball is placed in the sanitation process.

After the ball has been picked out of the process, the temperature sensor can be taken out of the sensor and be read by a computer by using a USB stick. The computer will display all the data which has been collected by the temperature sensor to show that Dorset fulfils the requirements set by the European commission. The results are displayed and cannot be modified in any way.

## DORSET CAN FULFILL THE REQUIREMENTS SET IN CHAPTER 3 OF THE EUROPEAN COMMISSION REGULATION NO 1774/2002.

### Logger is easy to locate

The ball is equipped with a RFID tag which makes it very easy to locate. The ball can then very easily be picked out by discharging a small amount of pellets from the auger together with the ball.



*Sensor ball with nut*



*Additional RFID tag*

# CRUSHER

## CRUSHER

The crusher belittles the dry product before entering the pellet press. This ensures that the particles have a uniform and certain size. The crusher is located below the intake bunker.

Dorset produces the crushers.



*The crusher consists of two rolls with teeth and distance controllers in between. The distance controllers can be adjusted to the requested size of the final end product.*



*Crusher in operation*

# PACKING EQUIPMENT (OPTION)

## BIG BAG FILLING STATION

Pellets are transported to the big bag filling station. When a big bag is full, another will automatically be filled.



## BAGGING STATION

Pellets are transported to the bagging station, weighted, and put in bags. The bags are then transported away by a conveyor belt.

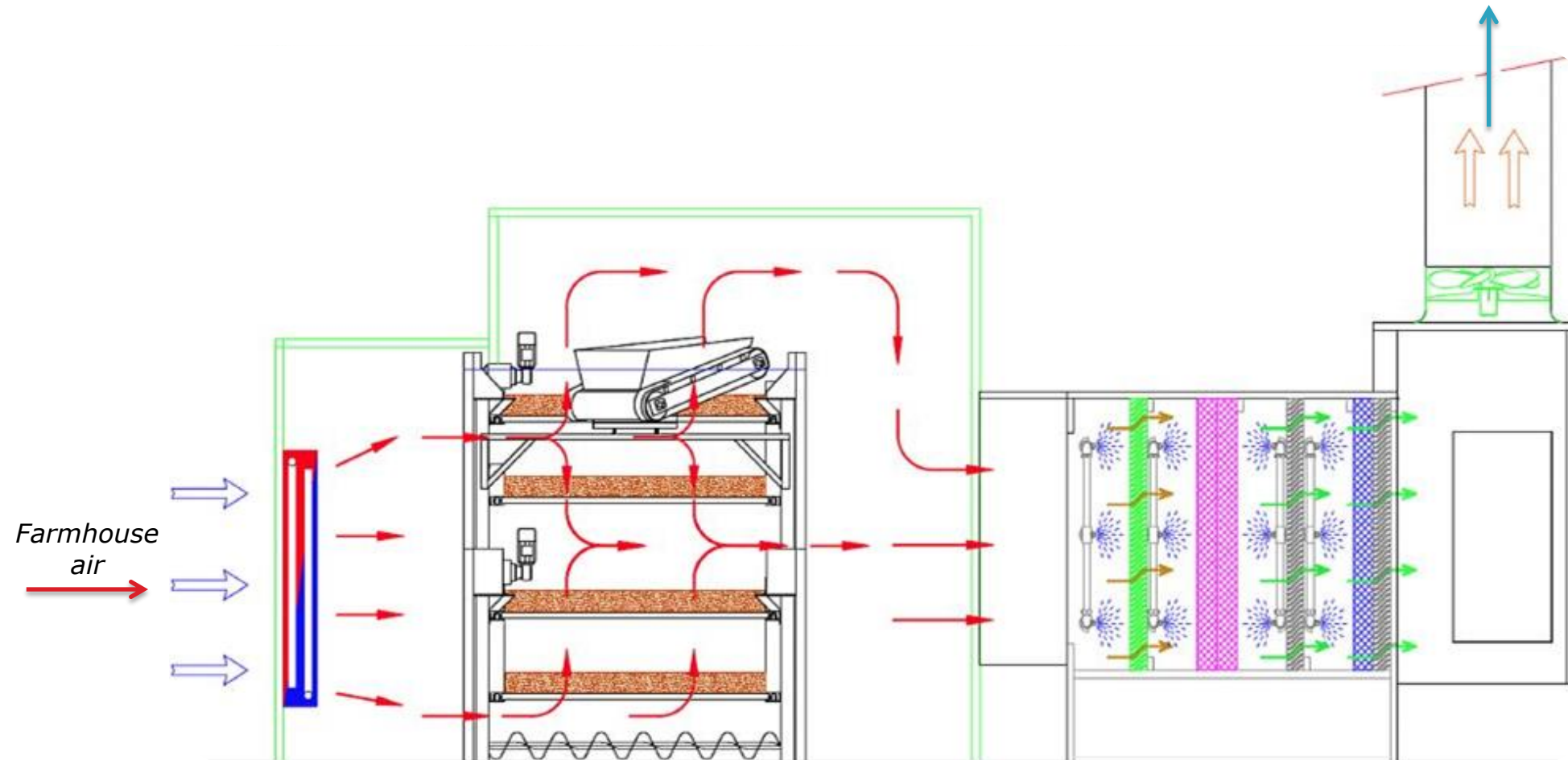


*25 kg bag filled by the bagging station*

# AIR CLEANING (OPTION)

70% less dust  
25% less smell

Ammonia level  
depending on  
manure input



# AIR CLEANING (OPTION)

## Chemical air cleaning (when a lot of ammonia is present)

- Removing ammonia

## Biological air cleaning (to remove smell and ammonia)

- Reducing smell
- Limited reduction of ammonia

## Combination of chemical and biological air cleaning

Dorset also delivers a combination of a chemical and biological air cleaning system to combine the advantages of both systems.



*Typical emissions:*

|         |                                   |
|---------|-----------------------------------|
| Dust    | < 10 mg/m <sup>3</sup>            |
| Ammonia | < 10 mg/m <sup>3</sup>            |
| Smell   | < 500 GE/m <sup>3</sup> (250 ouE) |

*GE/m<sup>3</sup> is a Dutch odour unit and is replaced by ouE/m<sup>3</sup>. ouE = European odour unit.*

# DORSET GREEN MACHINES

Dorset Green Machines is specialized in solutions for adding value to organic waste streams by using low value waste heat. We realize this by using a belt drying installation for drying waste with residual heat.

Dorset's drying concepts have proven themselves. By now, over 700 Dorset belt dryers are operational in the field. Due to the advanced technology and design our belt dryers are more cost efficient than comparable conventional belt drying systems.

The biological air cleaners of Dorset have proven themselves in over 18 years. Emission results are easily verifiable. The advantages of biological air cleaners are that they require little space, are cheaper and almost no maintenance is required.

The family company Dorset was founded in 1984 and has been producing belt dryers since 1997. Our latest developments concern ammonia stripping, pyrolysis and gasification.



## DORSET GREEN MACHINES

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FARM SYSTEMS

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IDENTIFICATION

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