

**ANDRITZ Gouda paddle dryer**  
Keeping heat transfer simple

# The process

## Versatile thermal processing

Handling products with the utmost care

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The ANDRITZ Gouda paddle dryer/cooler, a machine with a lot to offer, to most materials. Dried or cooled? The continuous indirect heat transfer setup within the paddle dryer's state-of-the-art interior produces quality product with incredible efficiency – and a minimum of maintenance. Powdered, granulated or pasty materials? The paddle dryer is built to handle products with the utmost care – even toxic materials.



▲ GPD type 6W

#### The ANDRITZ Gouda paddle dryer/cooler is suitable for the following processes

- Drying
- Heating
- Cooling
- Reacting
- Roasting
- Cooking, braising
- Calcining
- Sterilizing
- Solvent stripping
- Melting



▲ Various applications and end products



▲ Partial drying prior to incineration



▲ Suitable for different sludges

## Keeping heat transfer simple

### Modest energy requirements

There are many ways to dry products, but two things are essential: enough heat to evaporate liquid and a means of removing the vapor

For cooling, just use water. Saturated steam or hot oil are perfect for drying or heating. The hollow design of the paddle shafts means that the entire interior surface acts as one large heat exchanger. Controlled agitation by the rotating shafts with paddles deliver superb product-to-surface interaction, for an optimal heat transfer rate. Energy requirements? Suitably modest, especially if compared to direct drying with its associated large hot air flows. No wonder the tried-and-proven paddle dryer has found such a breadth of applications.

#### Advantages

- Maximum efficiency
- Coolant circulation provides optimum heat transfer
- Dust-tight or gas-tight



## Convective versus contact drying

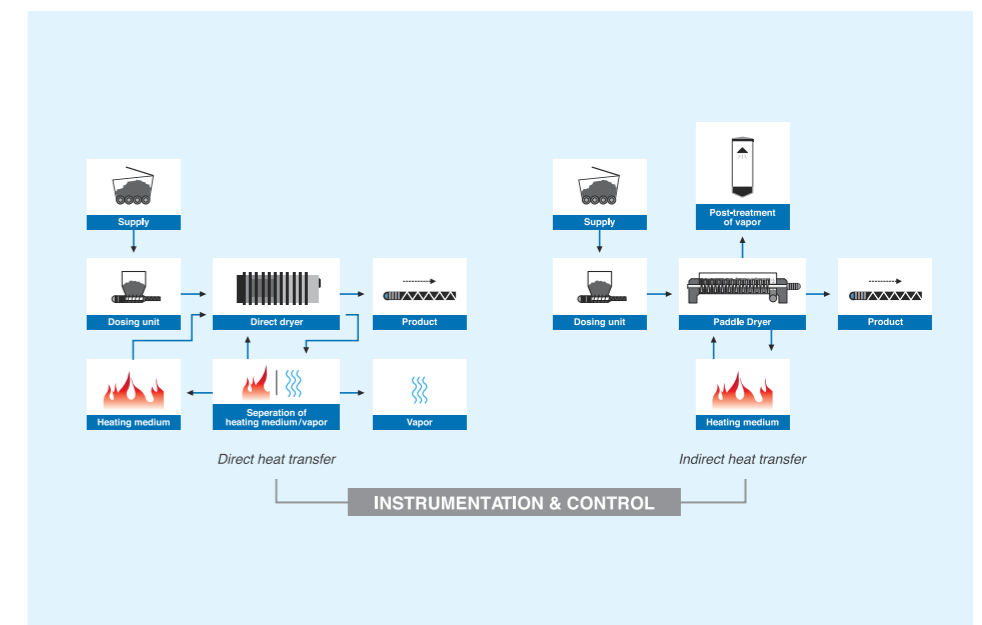
### The main advantages

Avoiding heat waste and unpleasant smells

A direct dryer uses hot air flow for both functions. Usually a lot of heat is wasted in the exhaust – and a lot of dust is created, resulting in unpleasant smells – so expensive equipment is required for removal. Solvent recovery can be a problem, too. An indirect/contact dryer neatly avoids all this:

- Airflows (if present at all) are negligible
- No separation of exhaust and heat medium
- Easy solvent recovery (at high temperatures)

Moreover, a fully enclosed operation enables the safe treatment of toxic, noxious and/or flammable product.

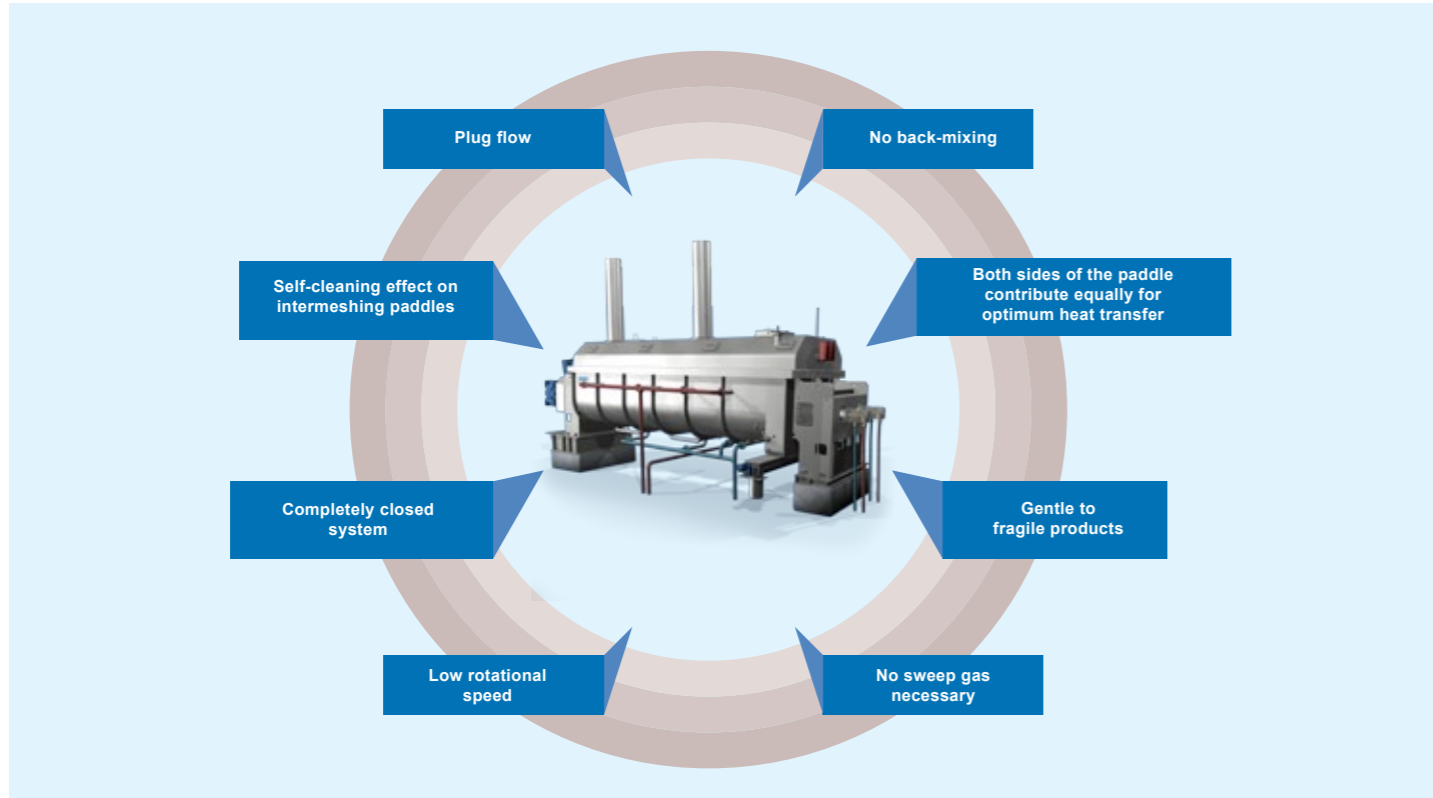




# Features and equipment

## The unique efficiency of the ANDRITZ Gouda paddle dryer/cooler

Easy treatment of toxic and flammable products



▲ The paddle dryer's unique features

Whatever its type, every paddle dryer unit is manufactured to a standard design – one which allows for many alternatives and is always adaptable to the extraordinary requirements of individual products and processes.

Skillfully engineered moving parts are crucial to the system. Heat transfer to individual particles can be slow unless they are both well agitated and in continuous contact with the heated surface. The paddles of the ANDRITZ Gouda paddle dryer/cooler play a large role in creating the ideal local environment.



▲ Dried sludge as alternative energy



### The paddles

The paddles of the ANDRITZ Gouda paddle dryer/cooler play an important role in creating the ideal local environment. The agitated fluidized particles are in contact with 100% of the heat transfer surface at all times. The front and rear sides of the paddles contribute equally to heat transfer because they are not slanted, and fragile product is not damaged because the smooth paddle form does not force it to flow. The uniquely designed paddles are self-cleaning, which makes it possible to treat products that are not free-flowing. For highly abrasive products, a special hard facing can be applied to the paddle surface.

### Advantages of the wedge-shaped paddles

- Paddles not pitched for optimum contact
- Good mixing in radial direction
- Plug flow in axial direction



### The trough

Two counter-rotating shafts arrayed with paddles pass through the horizontally jacketed trough. Heat transfer medium (steam, thermal oil, or cooling water) flows through the jacket, hollow shafts and even the paddles. As the product is fed in, the wedge-shaped paddles ensure perfect local mixing and mechanical fluidization. The shafts are precisely aligned: the paddles interweave as they turn, creating the ideal surface-to-product contact and plug flow.



### The cover

The paddle dryer's dust-tight cover can be adapted for full vacuum or overpressure with an adapted feed and product removal system. Condensation of any vapor produced during processing can be prevented by heat-tracing of the cover or a small air (or inert gas) flow to a central exhaust port. The whole unit is installed at a slight incline, so particles flow by gravity alone to the opposite end of the trough for discharge over a weir.



▲ GPD 12W at a WWTP in France

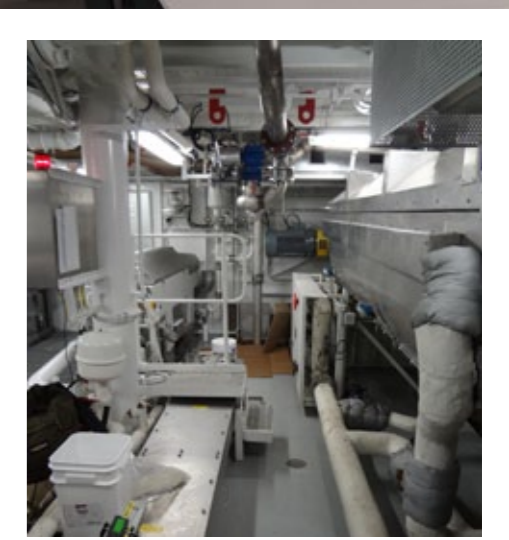
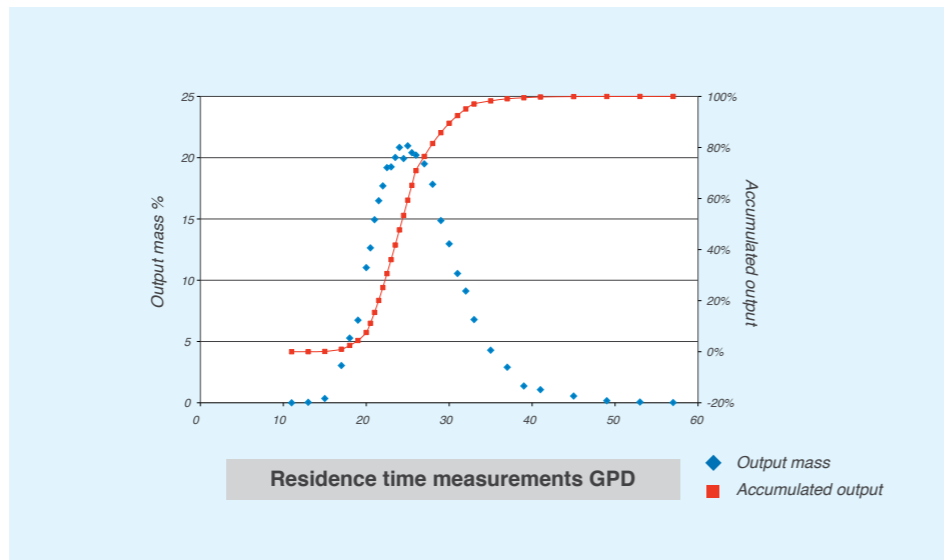


## Residence time

### Similar for each particle

As the product moves through the machine, the paddles ensure that the product is mixed well and flows easily through the machine.

The paddles provide excellent mixing in radial direction. The product is not mixed in axial direction. As it moves further into the machine, the product increasingly meets the end specifications with preservation of the plug flow. Even flow (plug flow) through the machine gives each product particle a largely similar residence time.



**Environmentally friendly cruises**  
ANDRITZ Gouda supplied a waste treatment system for cruise ships that are at sea for longer periods of time. This system consists of a paddle dryer, cooling screw, and automation; it and is used for treatment of waste water sludge and kitchen waste.

# Applications

## Chemical industry

Fully enclosed operation allows safe treatment of chemical products.



▲ End products with PET

Sometimes it is helpful to dilute released vapors with heated air or inert gas to guarantee a sufficiently low dewpoint to avoid condensation. For crystallizing and drying PET (polyethylene terephthalate), a special is available for ensuring degradation-free processing and a very narrow residence time distribution.

Special attention is paid to ensuring a tight seal in order to prevent solvent from escaping. Solvent recovery is enhanced by keeping the solvent concentration in the exhaust vapor as high as possible. Any non-condensables can be recycled and heated before being returned to the unit as sweep gas. Pressure is controlled by a small gas bleed.

### The following chemical applications can be handled by the paddle dryer

- Polymers (PET, SAP, PA)
- Gypsum
- Minerals
- Metal powders

### Advantages

- Good plug flow
- Fully continuous
- High capacities
- High heat transfer



▲ Treatment of polyethylene glycols

# Applications

## Environment industry

An ANDRITZ Gouda paddle dryer can also be used for sludge drying, thus decreasing the sludge volume and reducing transport and operating costs.



Many wastewater treatment plants have to cope with a waste stream of digested sludge. The sludge is normally dewatered by means of a centrifuge or belt filter press. After dewatering, the sludge has a typical dry solids content of approximately 20-25%, which is very suitable for thermal treatment in a ANDRITZ Gouda paddle dryer.

### Flexible for different sludges

The ANDRITZ Gouda paddle dryer offers a once-through drying technology that avoids back-mixing. The long sludge retention time combined with the average sludge temperature of 100 °C make it possible to provide pasteurization and hygienic treatment of sludge – any sludge. Due to the process, any type of sludge is accepted by this machine, making it extremely suitable for centralized drying plants accepting different sludges from

different regions. As back-mixing is not required, any residual moisture level can be chosen for the end product. This makes the machine very suitable for partial drying to 35-40% dry solids, which is required prior to incineration of sludge.

### The following environmental applications can be handled by the paddle dryer:

- Sewage sludges
- Biogas residues
- Industrial sludge
- Drilling mud
- Biomass
- Digested manure
- Paper sludges

### Advantages

- Drying through the plastic phase = no back-mixing
- Uniform product treatment = perfect hygienization
- Energy efficient
- Highest flexibility on sludge types
- Minimal off-gasses to treat
- Low mechanical speeds/low wear
- Compact design and plant lay-out
- Class A biomass

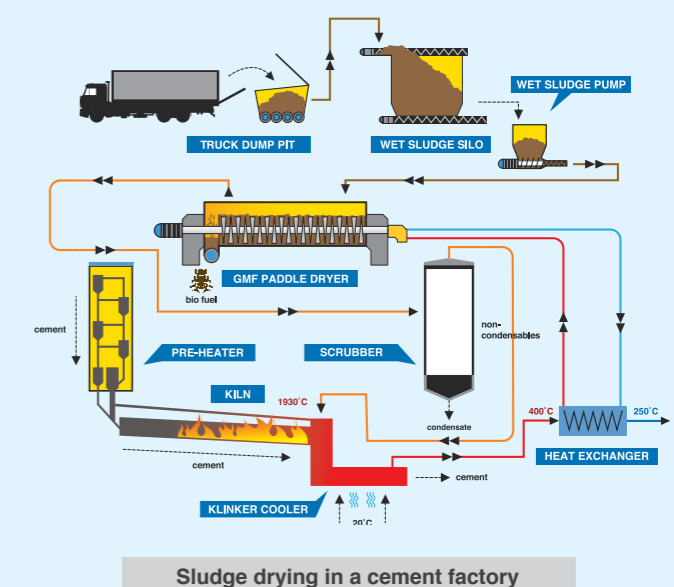
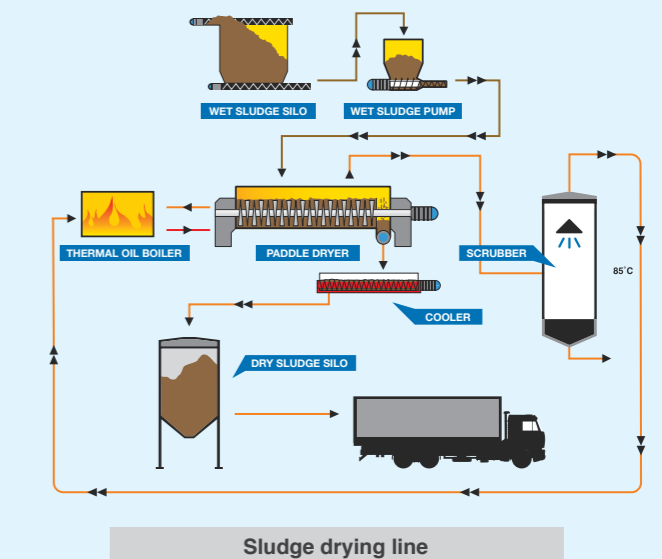
### Safety

- Basic concept:
- Closed system
  - No oxygen during process
  - O<sub>2</sub> and CO monitoring
  - Water spray
  - No need for explosion panels



### Turnkey solutions for various applications

Although each production line must be specially designed, a sludge drying line usually includes a wet sludge handling system, a paddle dryer, a dry sludge handling system, and a vapor treatment system. Over the years, extensive knowledge has been gained on all kinds of production process possibilities and machines to obtain the required final product characteristics.



### TÜV NORD CERTIFIED

The TÜV certificate has been granted for the general explosion protection concept of the ANDRITZ Gouda paddle dryer for full drying of mechanically dewatered sludges. If the explosion protective measures described in document GPD201101 dated April 13, 2011, as well as the plausibility check of the Explosion Protection Concept are observed with regard to hazards from potentially explosive mixtures, safe operation is ensured in the sense of the harmonized European standards.



# Applications

## Food industry

Special care is taken to prevent cross-contamination.



The ANDRITZ Gouda paddle dryer offers a means of processing the product in different temperature zones combined in one machine. Conveniently, it is often possible to apply cooling directly after drying or heating with the same equipment.

In food processing, special care is taken to eliminate sources of infection, and cleaning in place (CIP) can be considered. Polishing or coating of the parts in contact with the product is also useful where the product appears very sticky or when any contamination has to be avoided.

### The following food applications can be handled by the paddle dryer:

- Milk
- Starch
- Cocoa
- Flour
- Sugar
- All powders/granules

### Advantages

- No sweep gas
- Plug flow
- Low temperature possible due to vacuum
- Dry process
- Hygienic design



▲ Sugar

◀ Most food applications are semi-finished products



▲ Customer attendance during testing

## ANDRITZ Gouda pilot plant: A valuable test center

Determining the viability of new process technology and common success

A unique feature and part of ANDRITZ Gouda's R&D program is the pilot plant. The pilot plant is a valuable test center for simulating production processes with a view to testing or optimization of a process before implementation.

The pilot plant is also used to investigate the feasibility of a desired process. Combined with state-of-the-art manufacturing technologies, ANDRITZ Gouda offers an integrated approach for the setup of processing lines, contributing to significant cost savings (for the customer) in the production process.

ANDRITZ Gouda has three testing possibilities:

### Feasibility test

Requires a small amount of product to determine its drying/cooling ability.

### Bench-scale test

Requires approximately 1 kg of product on a bench-scale paddle dryer to determine behavior and produce a small sample.

### Pilot plant test

Requires approximately 100 kg of product to determine a guaranteed capacity and process parameters on a pilot plant paddle dryer.

ANDRITZ Gouda can offer rental pilot units for on-site test work at your location. Especially for sludge drying tests, ANDRITZ Gouda can offer a fully equipped mobile sludge drying pilot plant.

The proven calculation model for scaling up to industrial size ensures successful application to real-life processing.

◀ ANDRITZ Gouda pilot paddle dryer

## Worldwide service 24/7

### No added value but an absolute must!

Delivering quality equipment and always being there when the customer needs you are ANDRITZ Gouda's guiding principles.

#### Customer-orientated for over 100 years

ANDRITZ Gouda designs, builds, and maintains quality machines for the food, chemical, and waste processing industries. Characteristic of our technically oriented company is that we invest heavily in research and development in order to respond to the evolving needs of our customers. The development of machines is one thing. But if, like us, you sell far beyond the borders of your own country, your customers expect optimum service wherever they are and at all times.

Those that invest in this type of expensive equipment will expect constant use. Downtime means lost production. Delivering quality equipment and always being there when the customer needs you are ANDRITZ Gouda's guiding principles. Thus, good service is not added value for us, it is a matter of course.

#### Responsible for our customers

For decades, ANDRITZ Gouda has been known to the world's most important (inter)national companies as a very reliable partner. As with the production of our machinery, we strive to service our customers' equipment to the highest attainable level. We contribute greatly to our customers' production reliability, with a cost-effective maintenance budget for their machines.



▲ Wall thickness measurement

ANDRITZ Gouda provides service and maintains customer contacts from its headquarters in the Netherlands and from offices in Germany, Asia (Singapore and Indonesia), and the USA. The service team of experienced and well-trained specialists is jointly responsible for installation, commissioning and operation of the machines and, of course, is available 24/7 – worldwide. Customers receive assistance with training of operating and maintenance personnel, repair, overhaul, upgrade, parts supply, and relocation of machinery.

#### Parts supply

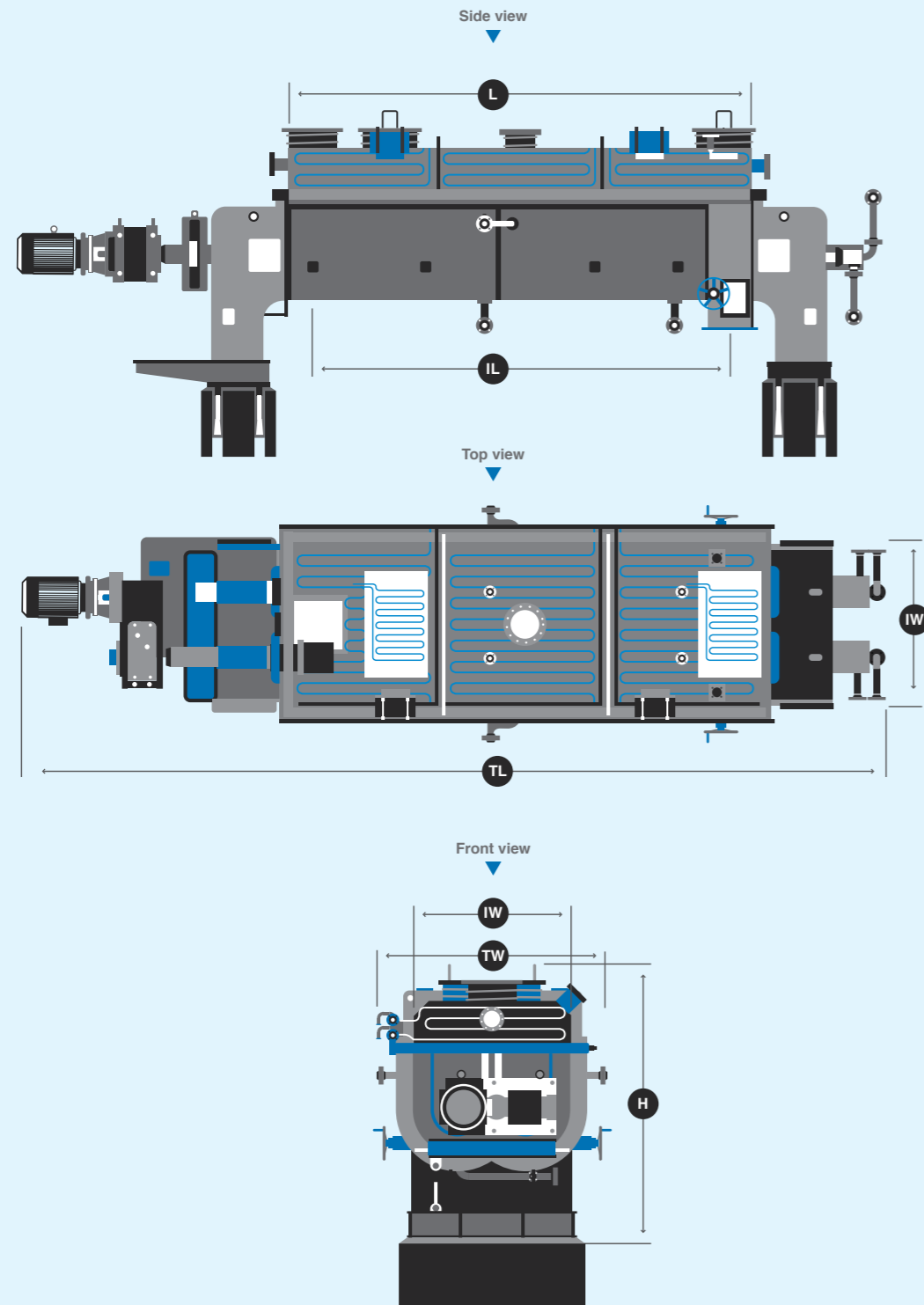
The service department is perfectly equipped to supply spare parts. Many critical machine parts are kept in stock in the warehouses in the Netherlands and in the United States. ANDRITZ Gouda can supply parts, globally, at very short notice. Our goal is to minimize customers' downtime and ensure their continuity of production.



Installing a paddle dryer ▶

# Dimensions and models

The ANDRITZ Gouda paddle dryer comes in a variety of sizes, varying from a cooling surface of 0.75 m<sup>2</sup> to 28 m<sup>2</sup>.



| TYPE OF PADDLE DRYER | TL    | L     | IL    | TW   | IW   | H     | D paddle | Heated area    | Effective product volume | Speed paddle shafts | Standard installed power | Standard lifting weights |
|----------------------|-------|-------|-------|------|------|-------|----------|----------------|--------------------------|---------------------|--------------------------|--------------------------|
|                      | mm    | mm    | mm    | mm   | mm   | mm    | mm       | m <sup>2</sup> | m <sup>3</sup>           | rpm                 | kW                       | kg                       |
| GPD 1.6W3            | 3550  | 2230  | 2035  | 630  | 300  | 1680* | 160      | 3.2            | 0.07                     | 40                  | 2.2                      | 1000                     |
| GPD 3W6              | 4000  | 1910  | 1635  | 1100 | 600  | 1300  | 300      | 6.0            | 0.21                     | 22                  | 3                        | 2300                     |
| GPD 3W9              | 4700  | 2625  | 2350  | 1100 | 600  | 1300  | 300      | 8.7            | 0.30                     | 22                  | 5.5                      | 2600                     |
| GPD 5W12             | 5400  | 2300  | 2010  | 1500 | 930  | 1800  | 500      | 12.2           | 0.72                     | 14                  | 7.5                      | 4600                     |
| GPD 5W18             | 6560  | 3250  | 2950  | 1500 | 930  | 1800  | 500      | 18.1           | 1.06                     | 14                  | 15                       | 5000                     |
| GPD 6W25             | 7200  | 3660  | 3255  | 1600 | 1105 | 2000  | 600      | 25.4           | 1.64                     | 11                  | 15                       | 8000                     |
| GPD 6W32             | 8100  | 4500  | 4100  | 1600 | 1105 | 2000  | 600      | 32             | 2.05                     | 11                  | 18.5                     | 9800                     |
| GPD 8W40             | 8140  | 4350  | 4050  | 2100 | 1475 | 2600  | 800      | 41.2           | 3.24                     | 9                   | 22                       | 17000                    |
| GPD 8W50             | 9100  | 5300  | 4900  | 2100 | 1475 | 2600  | 800      | 51.4           | 4.02                     | 9                   | 30                       | 18000                    |
| GPD 10W65            | 9800  | 5150  | 4700  | 2600 | 1855 | 3200  | 1000     | 65.0           | 5.83                     | 7                   | 37                       | 29000                    |
| GPD 10W80            | 11000 | 6320  | 5900  | 2600 | 1855 | 3200  | 1000     | 81.9           | 7.29                     | 7                   | 45                       | 32000                    |
| GPD 12W100           | 11370 | 6575  | 6130  | 2900 | 2200 | 3400  | 1200     | 103.4          | 10.09                    | 6                   | 55                       | 43000                    |
| GPD 12W120           | 12370 | 7575  | 7100  | 2900 | 2200 | 3400  | 1200     | 120.5          | 11.67                    | 6                   | 75                       | 50000                    |
| GPD 14W155           | 13500 | 7900  | 7400  | 3600 | 2570 | 3800  | 1400     | 152.9          | 16.42                    | 5                   | 90                       | 78000                    |
| GPD 14W190           | 15250 | 9700  | 9150  | 3600 | 2570 | 3800  | 1400     | 190.2          | 20.26                    | 5                   | 110                      | 87000                    |
| GPD 17W240           | 15325 | 9090  | 8440  | 4200 | 3130 | 4400  | 1700     | 241.1          | 29.06                    | 4                   | 160                      | 105000                   |
| GPD 17W300           | 17250 | 10995 | 10000 | 4200 | 3130 | 4400  | 1700     | 287.4          | 34.41                    | 4                   | 175                      | 115400                   |

\* Incl. frame

## ANDRITZ Gouda

ANDRITZ Gouda has been implementing complete process solutions for the environmental, chemical, and food industries for over 100 years. As a machine manufacturer as well as process solutions expert, ANDRITZ Gouda is able to handle all of the stages involved in designing and building plants, including engineering, service, installation, and commissioning.

ANDRITZ Gouda, as part of the international ANDRITZ GROUP, has several pilot plants available to test new materials, generate design data, and provide representative product samples. The proven calculation model for scaling up to industrial size ensures successful application in full-scale processing.



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