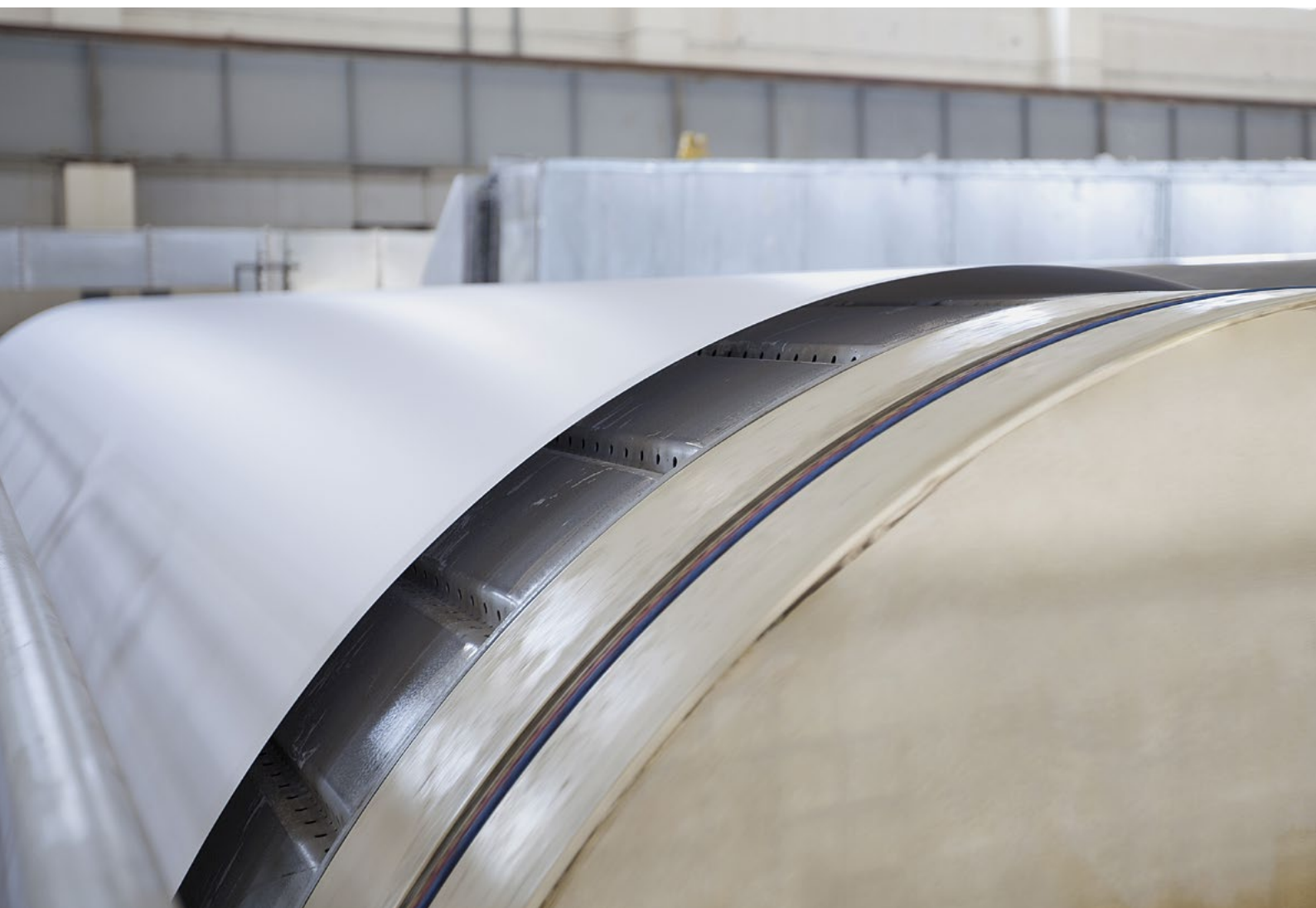


Non-contact drying and web guiding





Caution, wet paint!

... is the motto after pigment coating in the paper machine – no problem for the appropriate non-contact drying system: It must be contactless, fast, gentle and energy-efficient, including a stable web run and small space requirements.

For more than 40 years, Voith Paper has been dedicated to non-contact drying, being today's only provider of the entire range of non-contact drying and web guiding components on the market.

It is important that the freshly coated paper or board web is dried as soon as possible to avoid damage to the web surface and deposits on dryers and paper or board rolls.

Thanks to their extensive process know-how, Voith Paper engineers are able to meet additional requirements at the same time: The ever-increasing speeds of modern paper machines place particularly high demands on runnability: Free draws that are as short as possible and a stable web run are prerequisites for allowing efficient high-speed production lines. Space-saving solutions help to reduce investment costs.



Energy efficiency as a challenge for the future

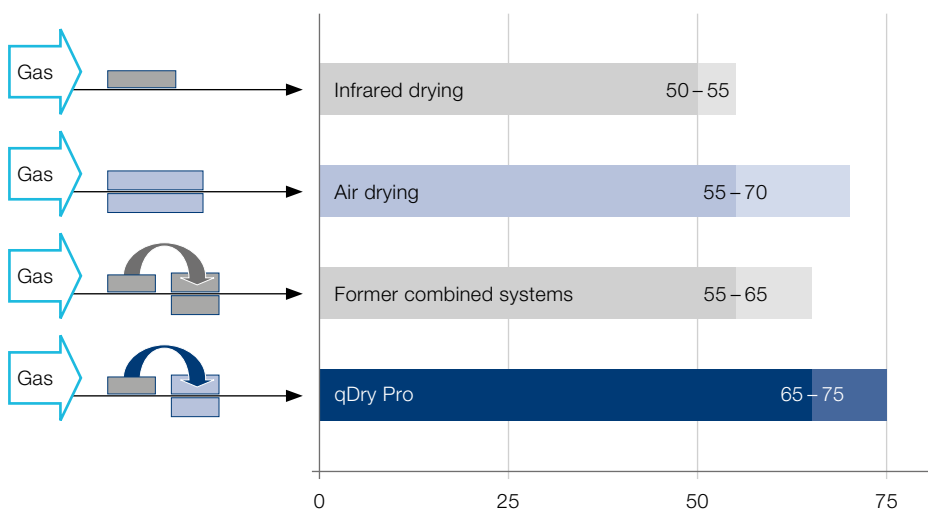
Sustainable handling of all resources is the order of the day, also for Voith Paper.

Special attention is paid to the optimal energy efficiency of all production lines. With the energy costs accounting for approximately 20 percent of the total costs of paper production and in the context of rising energy prices, improvements in energy efficiency are also an important approach to achieving cost savings in paper production.

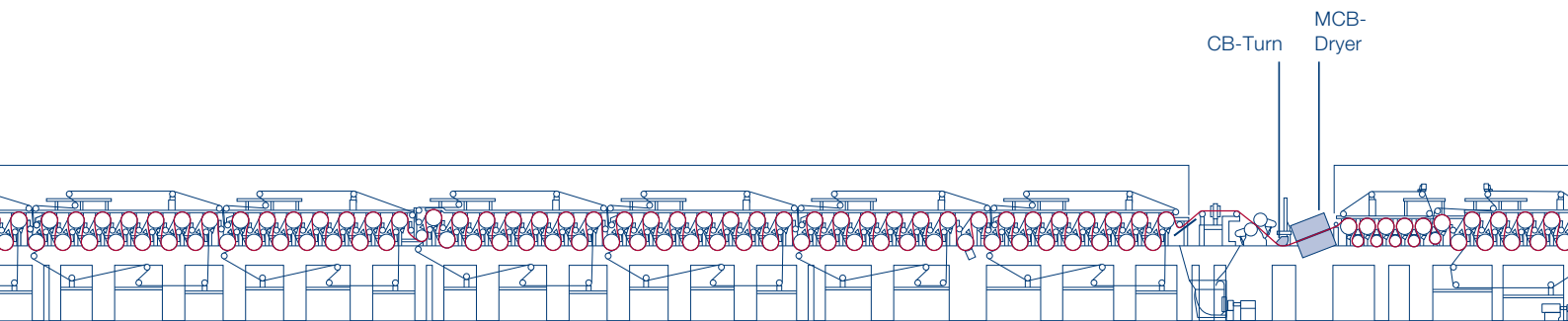
Voith Paper not only reduces the energy needed for non-contact drying by constantly optimizing the individual components, but also sets new standards thanks to their energy-efficient combination.

With the new qDry Pro concept, energy efficiency of non-contact drying is increased by up to 40 percent compared to previous arrangements, while investment and operating costs are reduced at the same time.

Comparison of energy efficiency

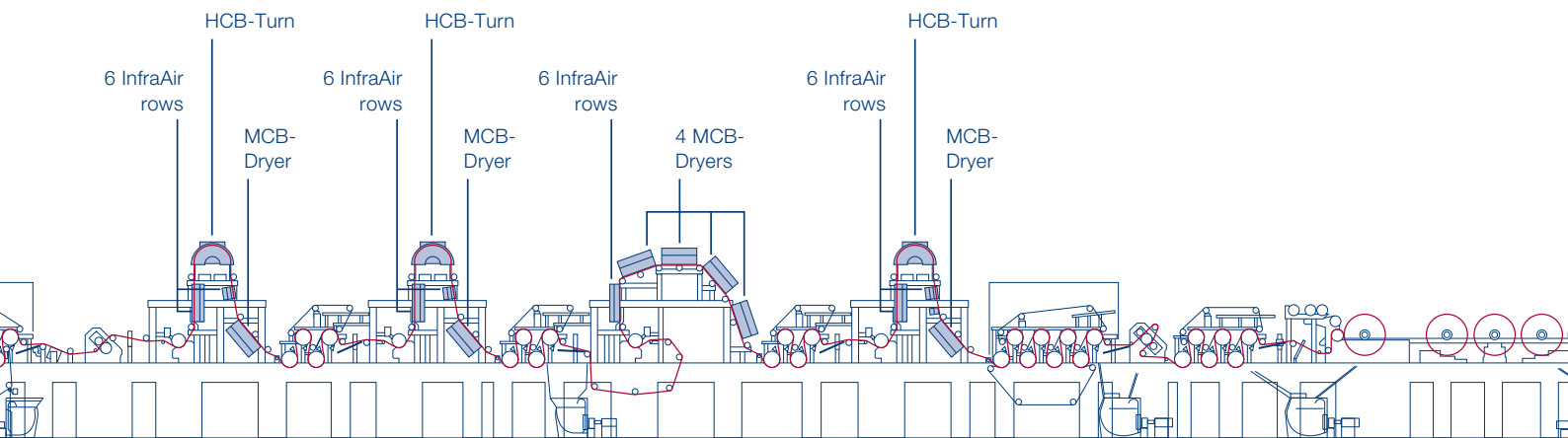
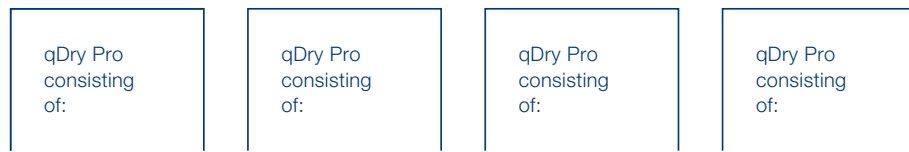


Achievable system efficiency in % (depending on operating conditions and configuration).



The diversity of non-contact web guiding and drying

Using the example of a dryer section of a fast-running board machine.



Overview non-contact drying and web guiding

| | Non-contact web guiding | Non-contact drying | CD moisture profile control | Web cooling |
|-----------------|---|--------------------|-----------------------------|-------------|
| qDry Pro | Energy-efficient and space-saving combination of several single components! | | | |
| CB-Turn | • | | | |
| CB-Floater | • | | | |
| InfraAir | | • | | |
| InfraElectric | | • | | |
| HCB-Turn | • | • | | |
| MCB-Dryer | | • | | |
| CCB-Dryer | | • | | |
| MCB-Can | | • | | |
| MCB-Cooler | | | | • |
| TurboDryer S | | • | | |
| InfraMatic | | • | • | |
| OnQ Module IR | | • | • | |



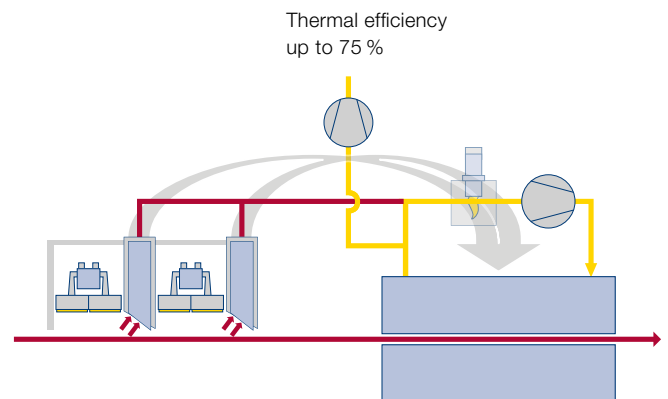
qDry Pro – the future of non-contact drying

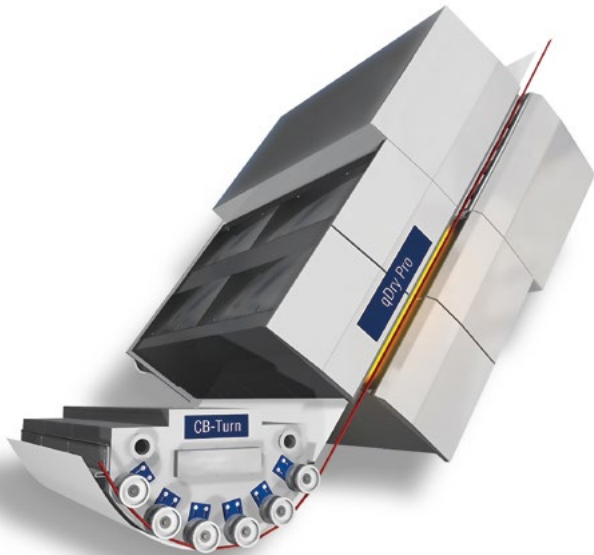
Maximum drying quality – but 40 percent less energy.

qDry Pro is the energy-saving compact combination of infrared and hot-air drying. The waste heat of upstream infrared dryers is used for heating the air dryer. Therefore, no separate heating source is required for air drying. However, an optional combustion chamber can be installed in the hot-air dryer for heat-up when the system is started.

Thus, very gentle but intense drying is achieved, while the exhaust air temperature after the air dryer is reduced considerably compared to conventional systems. The system efficiency of qDry Pro of up to 75 percent is the highest of all non-contact drying systems developed by Voith so far. If possible, the waste heat from the air dryer is used for e.g. heating the machine hall or for heating the process water, thus achieving more potential for increasing overall efficiency.

Energy efficiency with the qDry Pro system: The waste heat of infrared drying is used to heat the air dryer





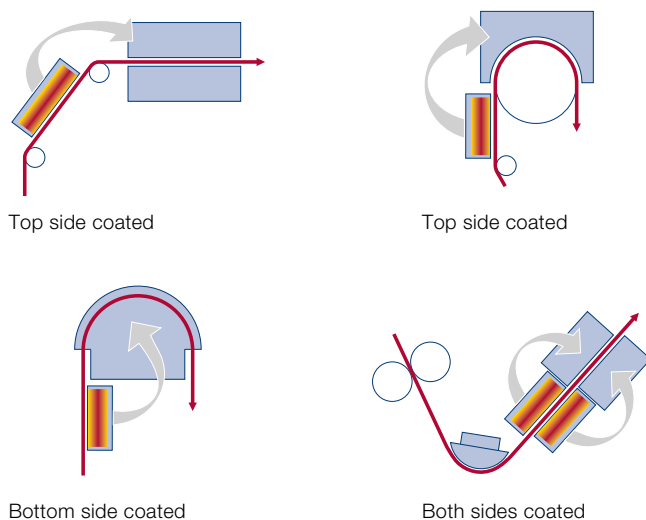
qDry Pro can be used for all paper and board grades that are coated on one or both side(s). It may be equipped with any Voith emitter and provides a tailored solution for any application. Even InfraMatic systems may be integrated for moisture CD profile control.

qDry Pro may also be used in rebuilds to increase both quality and energy efficiency. It is possible to connect existing infrared and air dryers to a new air system according to the qDry Pro concept.

qDry Pro benefits

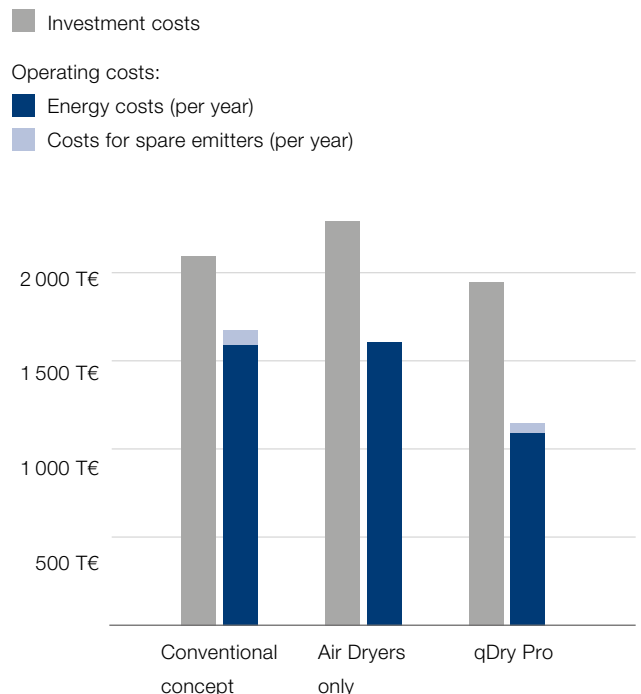
- + Low operating costs
- + Environment-friendly thanks to heat recovery
- + Excellent drying quality
- + Contactless web run
- + Optimum runnability
- + Space-saving design
- + Suited for rebuilds

The qDry Pro system: The ideal solution for any application



Comparison of investment and operating costs

Using the example of non-contact drying with an energy transfer of approx. 2.9 MW after the top coat for white-top testliner.





1

MCB-Dryer, MCB-Can, CCB-Dryer, MCB-Cooler

The MCB-Dryer is a proven hot-air dryer for gentle, contactless drying, thus avoiding damage to the web while preventing deposits on machine components at the same time.

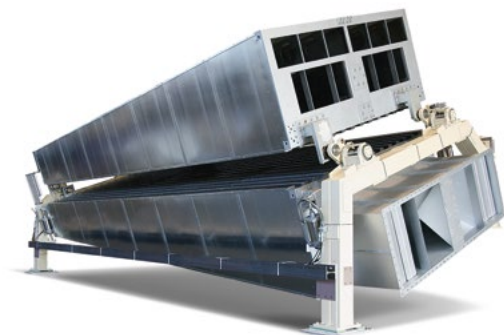
The optimized impingement jet flow used for drying allows very efficient heat transfer. Thanks to the alternating arrangement of the nozzle bars with the specially developed CB2 nozzles, the paper is guided through the dryer in a slightly sinusoidal web run. The sinus shape stabilizes the web and prevents web edge curl. Due to the special design and the materials used, the MCB-Dryer features an extremely high thermal – and thus dimensional – stability.

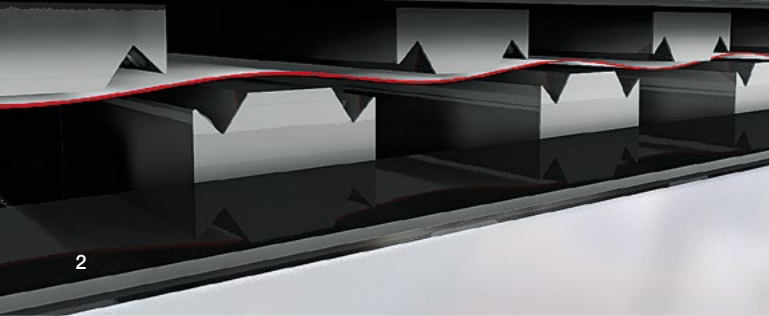
The MCB-Dryer may be designed single-sided or double-sided and can be heated either with gas or with steam. The circulating air system ensures maximum energy efficiency: The exhaust air energy may optionally be used to pre-heat the fresh or combustion air through a heat exchanger.

If possible, the MCD-Dryer is integrated into a qDry Pro system and heated with the exhaust air from upstream infrared dryers.

The double-sided design of the MCB-Dryer saves additional energy: The newly developed retraction device requires minimum energy, since the weight of the two dryer hoods is counterbalanced.

The new retraction device saves energy





- 1 MCB-Dryer
- 2 Stable web run
- 3 Highly efficient heat transfer

MCB-Can

The MCB-Can is a space-saving variant for hot-air drying a one-sided coat: The uncoated bottom side of the web rests on the drying can, the coated top side is dried by the MCB-Can.

CCB-Dryer (Compact CB-Dryer)

The CCB-Dryer has been newly developed for one-sided applications and working widths of up to 7 500 mm. Its design is extremely compact: Heat exchanger and circulation air fan are flanged directly to the dryer. Thus, additional pipelines are not required and installation costs are reduced. The CCB-Dryer is operated with steam.

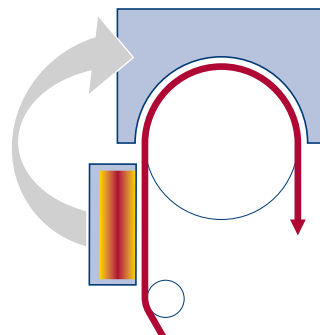
MCB-Cooler

To cool the web, the MCB-Dryer can also be operated with cool ambient air. If required, the MCB-Cooler is used upstream of coating units or the reeler to reduce the web temperature. This may be necessary in special cases to prevent losses in quality of the coated web or damage to the parent roll.

MCB-Dryer benefits

- + Gentle, non-contact drying
 - + Stable web run
 - + Highly efficient heat transfer
 - + Extremely high thermal shape stability
 - + Energy-saving retraction device
 - + Low overall height
-

MCB-Can





HCB-Turn

Innovative hot-air drying and contactless web guiding in confined spaces.

The development of the HCB-Turn has revolutionized the web run in the coating section: After applying the one-sided coat to the bottom side, the web usually had to be guided over several paper and turning rolls against the direction of paper run to dry the coated side without contact; with the HCB-Turn, the same effect can be achieved using much less space. The HCB-Turn ensures both contactless web guiding and energy-efficient hot-air drying. It can be positioned directly downstream of the coating unit, takes up little space and helps to save investment costs since paper and turning rolls are no longer required. Stable web run and energy efficiency also set new standards for the HCB-Turn.

The web is guided at a relatively short distance to the energy-efficient, closely positioned CB2 nozzle bars, thus achieving a higher specific evaporation performance with the HCB-Turn than with straight air hoods. Special exhaust devices suck off the hot, humid air and return it to the circulation air system. Hence, both overheating of the surrounding area and energy losses are prevented.

In the ideal case, the HCB-Turn is combined with infrared systems to a qDry Pro, with the waste heat of infrared drying being used again for heating the HCB-Turn. Due to the very low space requirements, the HCB-Turn is ideally suited for rebuilds.



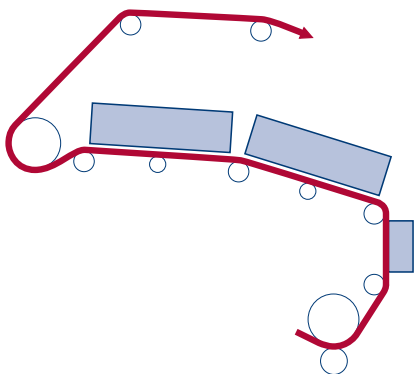
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- 1 HCB-Turn
- 2 Detail view of HCB-Turn

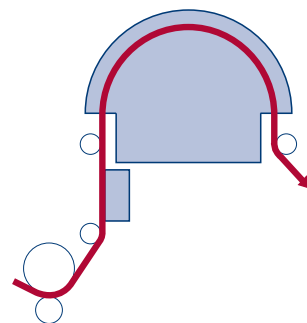
HCB-Turn benefits

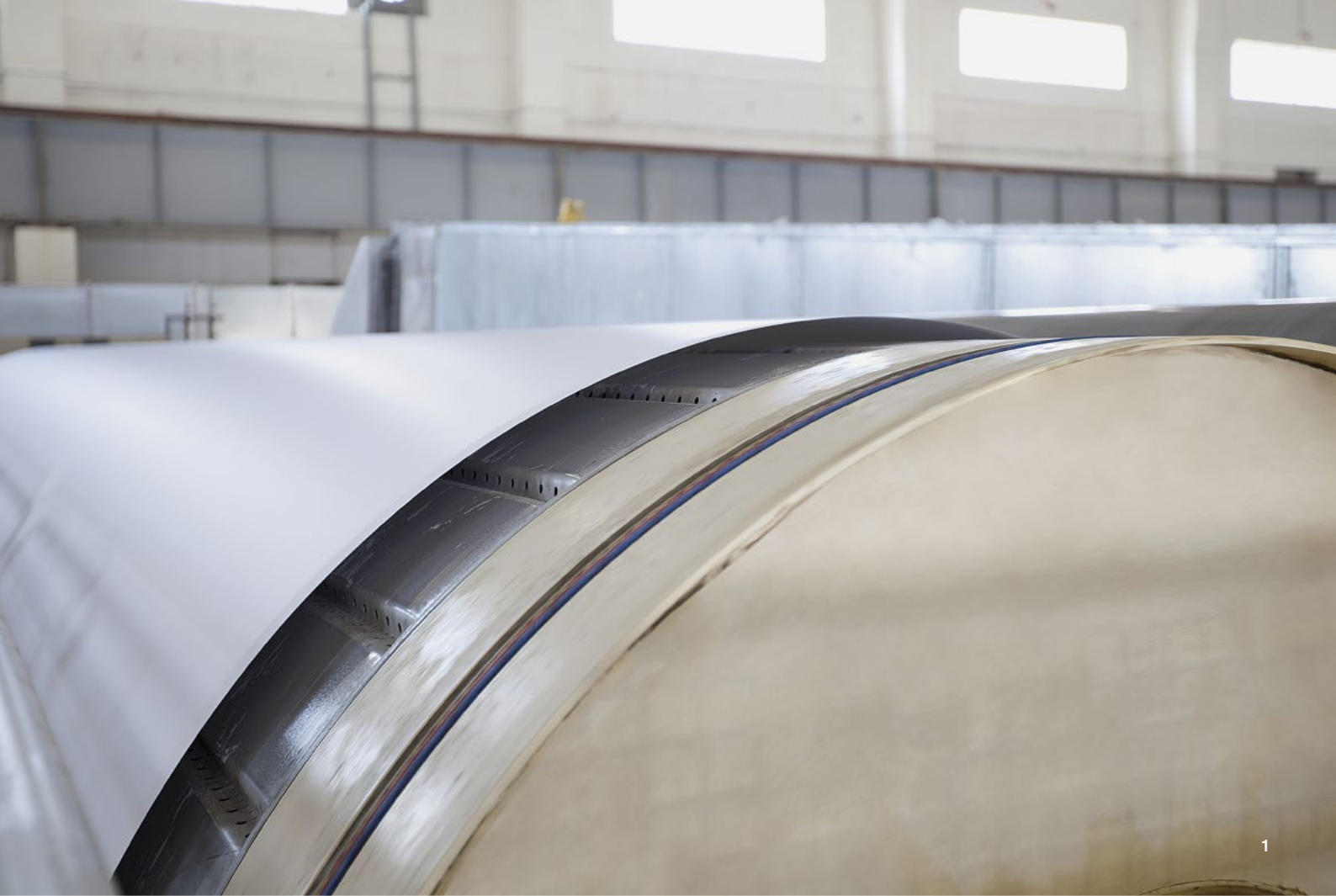
- + New, space-saving web guiding variant
 - + Low investment costs
 - + Homogenous hot-air drying combined with contactless web turning
 - + High efficiency due to optimized air flow system
 - + Low operating costs
 - + Stable web run, short free draws
 - + Perfect for drying the bottom side of the web
 - + High web tensions even with hot air possible
-

Conventional web guiding without HCB-Turn

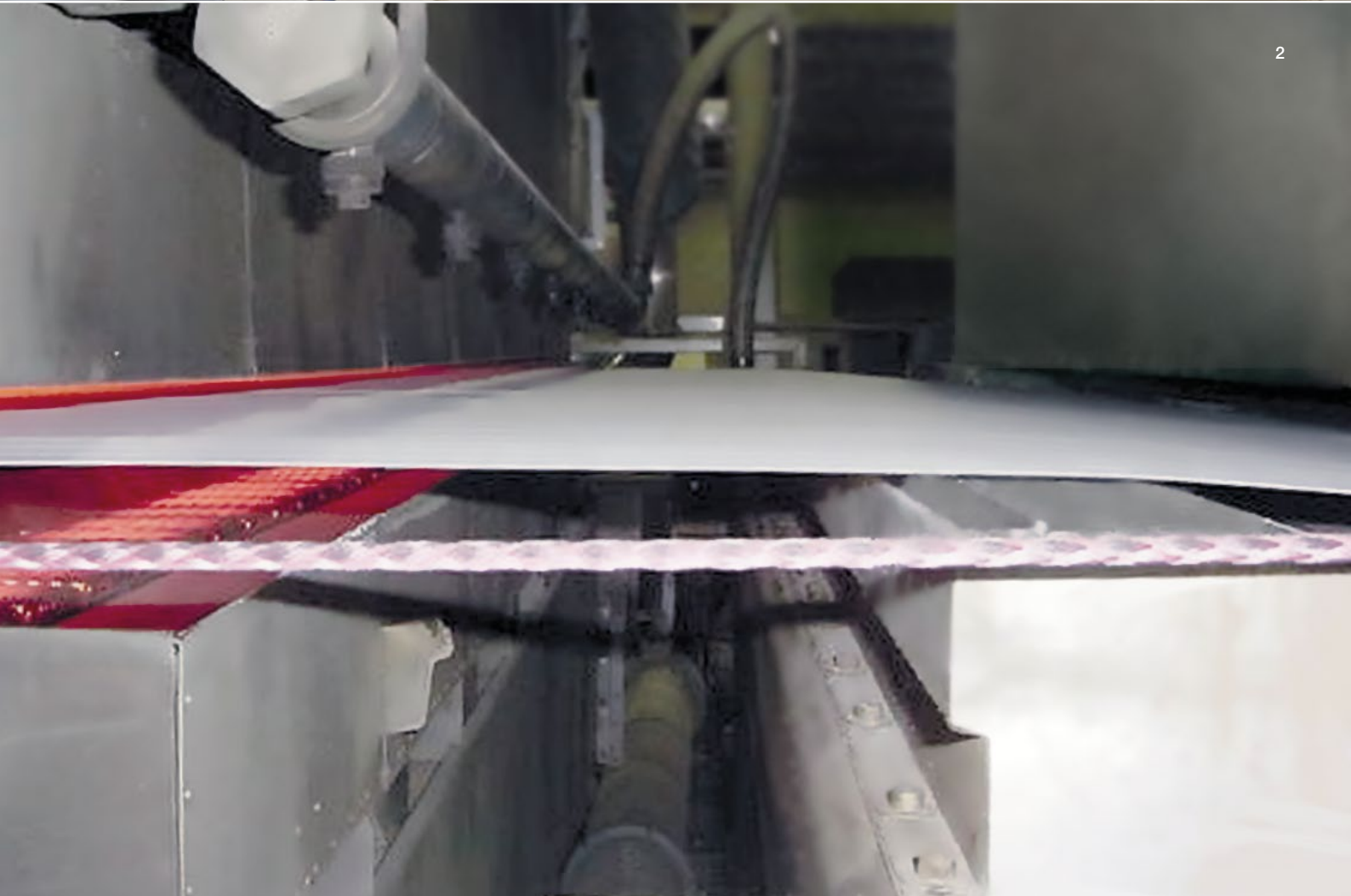


Space-saving web guiding with HCB-Turn





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2

CB-Turn, CB-Floater

CB-Turn – non-contact web guiding.

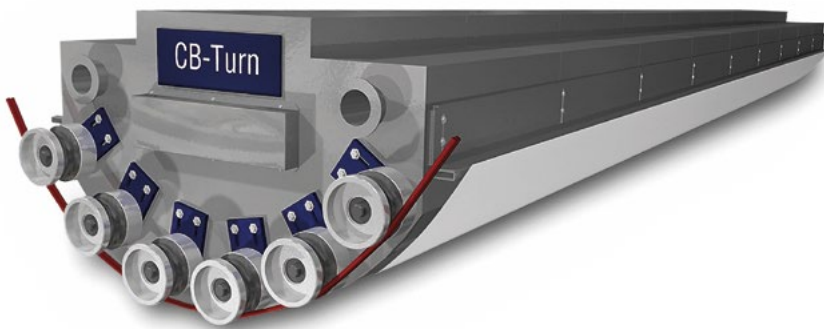
After size or film presses, the CB-Turn guides the freshly coated paper or board on an air cushion, followed in most cases by non-contact drying of the web. The CB-Turn has been used for web widths of up to eleven meters so far.

The special nozzle geometry of the CB-Turn surface builds up a homogenous air cushion over the entire circumference, thus ensuring a very stable web run. At the web inlet and outlet, patented diffusor wings reduce the amount of air escaping to the surroundings, stabilizing both air cushion and web run as a result. In addition, a multi-chamber system allows to adapt

the air cushion across the web. Due to their special geometry, the CB1 nozzles developed by Voith Paper are much less sensitive to dirt than conventional slot nozzles, thus reducing maintenance and cleaning requirements.

The CB-Turn is very energy-efficient: Since it has a substantially higher pressurized area compared to conventional Airturns, the CB-Turn does not need as much pressure and the air volume needed is reduced by approximately 30 percent. This helps to achieve considerable energy savings in ventilation.

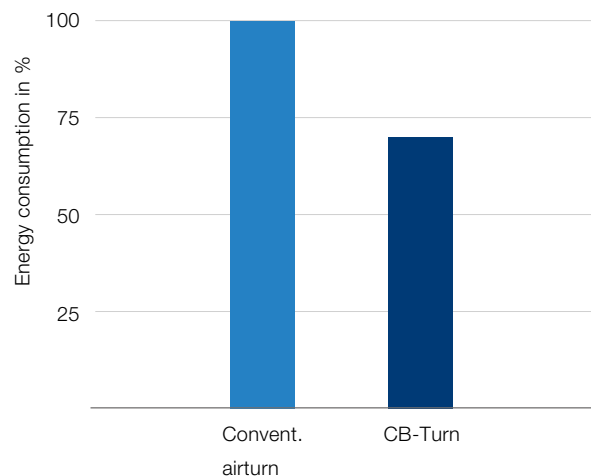
CB-Turn



CB-Turn benefits

- + Optimum surface quality
- + Stable web run
- + Low energy consumption

Energy consumption of CB-Turn compared to conventional airturn



1 Detail view of the CB-Turn

2 For smaller web turns up to approx. 7°, the CB-Floater can be used for guiding. Instead of a roll (in the picture on the bottom right)



InfraAir, InfraElectric

With non-contact drying, it is the task of the infrared dryer to immobilize the fresh coating color as soon as possible on the web. This requires fast, effective and uniform heating of the web, which can be done best by gas-heated or electrical infrared emitters.

The electrically heated InfraElectric is the non-contact drying system with the highest energy transfer density. Since gas-heated operation of infrared dryers is more economical in most cases, InfraAir systems are mainly used nowadays. Depending on the application, InfraAir may be equipped with different emitters (metal or ceramic, input power between 5 and 10 kW). More than 1 250 InfraAir systems have been installed all over the world in many pioneering paper and board machines with widths up to eleven meters.

As with all Voith Paper infrared dryers, a circulating air system is used to remove the evaporated water. Today, the infrared dryers are usually integrated into qDry Pro systems, thus allowing further use of the exhaust energy in the hot air dryers and considerably increasing the total efficiency of non-contact drying.

Compared to other infrared dryers available on the market, both InfraAir (if equipped with K6500 emitter modules) and InfraElectric offer the possibility of stepless power adjustment, which can be used for CD moisture profiling (refer to Infra-Matic / OnQ Module IR).

Easy maintenance, low tendency towards soiling, as well as long emitter service lives ensure economic operation of the infrared dryers.



2

- 1 InfraAir
- 2 InfraElectric

Benefits of infrared coat drying

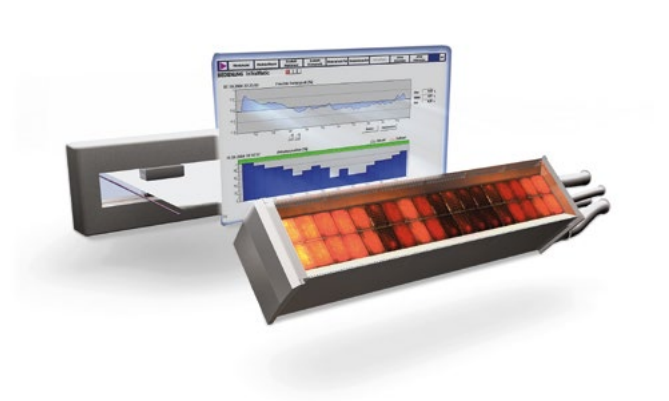
- + Fast immobilization of coats
- + Stepless power adjustment
- + Flexible installation possibilities
- + Easy maintenance
- + Rapid change of emitter modules

CD profile control with infrared dryers:

- InfraMatic (gas-heated)
- OnQ Module IR (electrically heated)

Both gas-heated and electrical infrared emitters can be used for CD moisture profile control. To even out differences in the moisture content of the web, the emitter modules, (150 mm wide with InfraMatic and 180/90/60 mm wide with OnQ Module IR) which are arranged across the web, are controlled individually and steplessly in the area of 1 to 100 percent.

Stepless CD profile control in the area of 1 to 100 percent



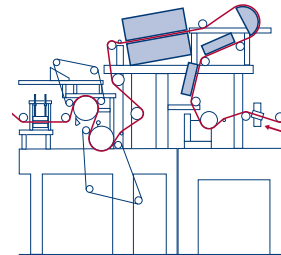
Rebuilds

Making the production process better – less expensive – more economical.

The modern non-contact drying units prove themselves in practice – also in rebuilds: The compact and efficient individual components ensure fast immobilization of the coat, while optimally using the available space which is usually very limited in rebuilds. The energy efficiency of qDry Pro helps to reduce energy costs significantly.

Köhler paper mill, PM 1,
Kehl, Germany

Thermosensitive paper,
inkjet paper



Quality increase due to integration of a precoat

Target

Improvement of surface quality due to additional precoat, cost reduction due to saving of coating pigments

Initial situation

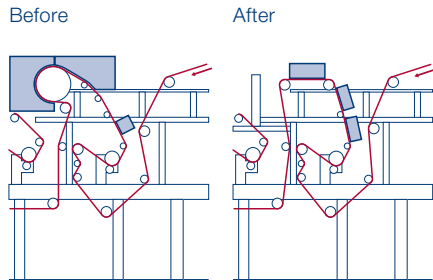
Rather limited space, very high demands on paper quality and design of new machine components

Implemented solution

Installation of a DynaCoat unit for one-sided coating, as well as a qDry Pro, comprising two InfraAir infrared dryers and an energetically coupled hot air drying system (double-sided MCB-Dryer). The web is turned on the coated side by a CB-Turn.

Reno de Medici paper mill, Arnsberg, Germany

White top liner



Considerable energy savings thanks to qDry Pro

Target
Saving energy in non-contact drying

Initial situation
Large, inefficient air dryer

Implemented solution
qDry Pro system comprising two IR hoods with a total of 8 rows and an air hood

Reduction of energy consumption:

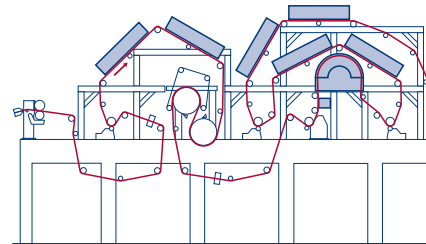
Before:
Gas: 1 900 kW
Electrical energy: 240 kW

After:
Gas: 1 200 kW
Electrical energy: 100 kW

Savings on energy costs:
200 000 Euro / year

Ningbo board mill, BM 2, China

Ivory board



Limited space? No problem for the HCB-Turn!

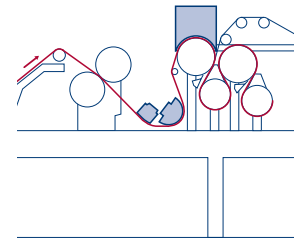
Target
Additional coating of board bottom side

Initial situation
Very limited space conditions

Implemented solution
After the additionally installed coating unit, the coat is dried by means of InfraElectric and HCB-Turn

Varel paper mill, PM 4, Germany

Corrugating medium, testliner, white top liner



Non-contact drying for additional coat

Target
Additional pigment coat on white lined top for improved printability

Initial situation
Limited space conditions

Implemented solution
Installation of a SpeedSizer + 2 CB-Turn elements + MCB-Can

- 1 K 6500 metal emitter
- 2 V6 ceramic emitter with metal mesh
- 3 V8 ceramic emitter with metal rods
- 4 HelioX ceramic emitter



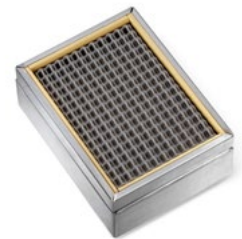
The ideal emitter for any application

Voith can look back onto decades of experience in designing gas-heated infrared emitters and knows the specific requirements of the paper industry.

Voith infrared dryers provide a very uniform and intensive heat transfer to the freshly coated paper, thus ensuring fast immobilization of the coat on the web. Drying intensity is adjusted according to the respective paper or board grade. When selecting the suitable emitter, optimal system efficiency of

non-contact drying is a priority. If possible, the waste heat of infrared drying is used for downstream air dryers in a qDry Pro arrangement. Long service life and low life cycle costs ensure an economic operation of the emitters.

Complete range of infrared emitters



| | K6500 | V6 | V8 | HelioX |
|------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|
| Input power | up to 6kW | up to 8kW | up to 8kW | up to 14kW |
| Type / Material | Metal emitter | Ceramic emitter | Ceramic emitter | Ceramic emitter |
| Front | Metal grid with nozzle plates | Fine metal mesh | Metal rods | Ceramic cell structure |
| CD profiling | 1 – 100 % stepless | – | – | – |
| Dimension | 150 x 200 mm | 150 x 200 mm 143 x 204 mm | 150 x 200 mm 143 x 204 mm | 150 x 200 mm 143 x 204 mm |



K6500 – The robust emitter

For positions next to coaters where harsh conditions occur, the robust K6500 is your perfect choice, because the gas nozzles are optimally protected against outer influences. The emitter plates woven in the metal grid are arranged directly above the nozzles. This optimizes the heat transfer while simultaneously protecting the gas nozzles from splashes.

V6 – The economic emitter

If your focus lies on cost-saving versatility, our economic solution V6 is the perfect choice. The combination of ceramic material used for the nozzle plate and the fine-meshed metal grid protecting the surface makes this low-cost emitter very popular among our customers. The V6 grid design minimizes the frame effect, ensures a very homogenous heat transfer and unfolds a high overall efficiency.

V8 – The high-power emitter

Due to its high temperature resistant front, consisting of metal bars, the V8 emitter combines robustness and high power over a long lifetime. It is ideally suited for applications where very intensive infrared drying is required and space for drying is limited. The V8 emitter can be used in all kinds of installation positions.

HelioX – Welcome the new generation

HelioX provides outstanding performance based on the special geometry of the emitting body. As the first of its kind, the emitter structure of HelioX is manufactured by advanced 3D print technology, achieving unmatched values for efficiency, combustion quality, lifetime and safety.

Benefits of Voith infrared dryers

- + Homogenous energy transfer
 - + Uniform temperature distribution
 - + High efficiency
 - + Stable operation, insensitivity to secondary flows
 - + Long service life
 - + Low life cycle costs
-

Services

Mobile pilot infrared units

Voith Paper has mobile pilot infrared units which can be installed temporarily in existing paper machines.

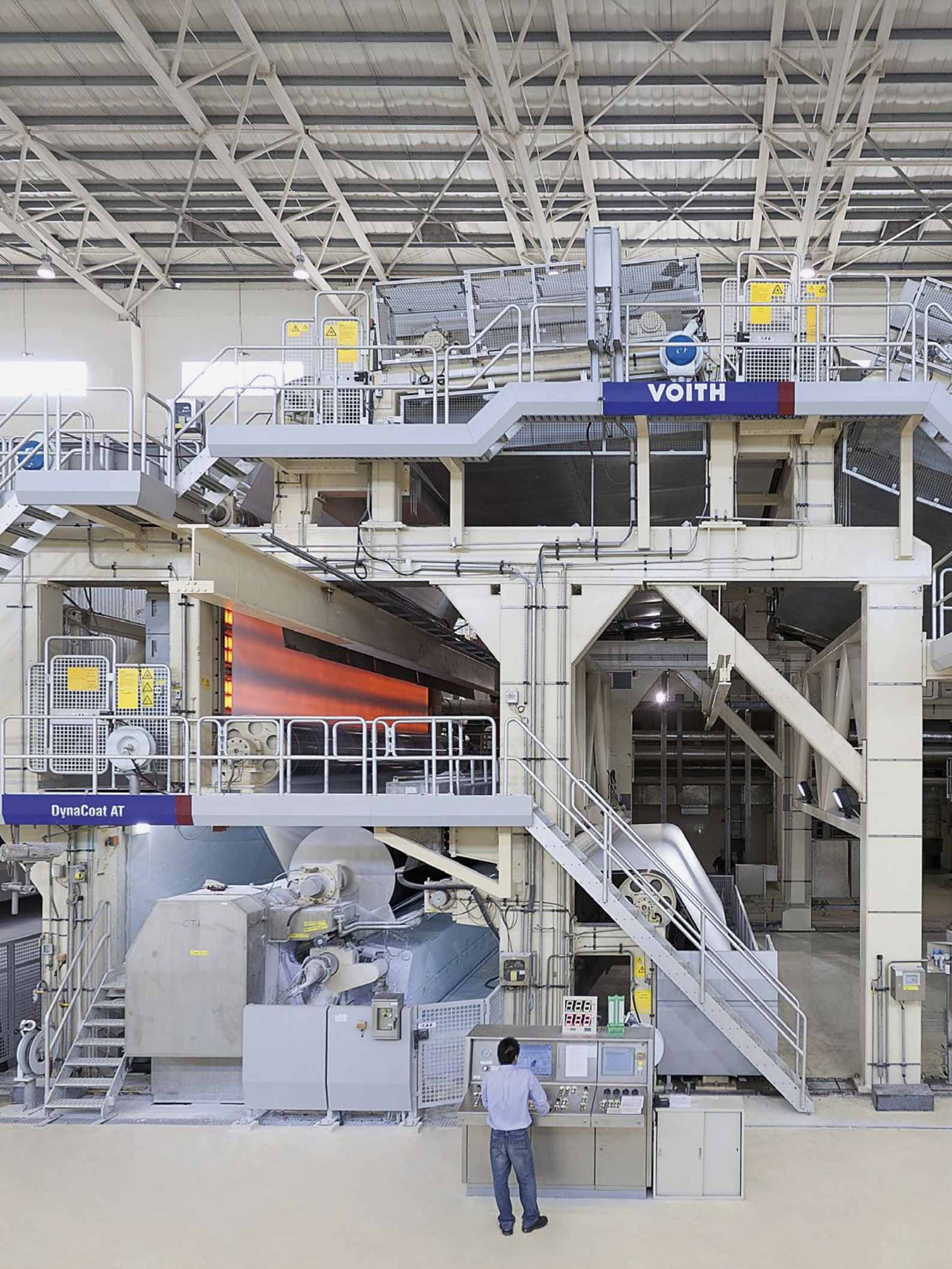
Thus, it can be tested at the machine whether and which in-frared emitters are suited i.e. for a rebuild and in which temperature range the best results can be achieved.

CoatDryPro simulation program

CoatDryPro is a Voith Paper simulation program that allows to model the drying of surface coats.

With this tool, the units of non-contact drying can be configured to meet all requirements of coat drying and the operating conditions can be optimally adapted to the coated paper.





VOITH

DynaCoat AT

888
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