Deflection compensating rolls by Voith – reliable technology for a market orientated quality of your paper and board grades
Voith – Our Company.

Voith is the reliable partner for essential industries. We set standards around the world in our markets for paper, energy, mobility and service.

Our History

The history of Voith begins in a small craftsman’s workshop in 1867. Today, we are one of the largest family-owned companies in Europe. Our independence as a family-owned company allows us to pursue our strategies and goals far into the future.

Facts and Figures

<table>
<thead>
<tr>
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<th>As of 2005</th>
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<tr>
<td>Sales</td>
<td>€ 3,551 million</td>
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<tr>
<td>Net income</td>
<td>€ 98 million</td>
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<tr>
<td>Number of locations</td>
<td>over 200 worldwide</td>
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<tr>
<td>Number of employees</td>
<td>over 30,000</td>
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Markets

Our equipment, components and services allow us to make a major contribution towards our customers’ success. The global demand for paper, energy, mobility and services will continue to grow in the coming years. We will be there to watch these markets of the future develop, and to play our part in shaping them.

Customers

Everything we do is centered around the needs of our customers. Our global presence and proximity to our customers allow us to create a working relationship based on confidence and trust. We want to draw on our engineering skills, our innovative strength and our solidity in order to be a reliable partner for generations to come.

We Are Shaping the Future

People at Voith have written and re-written technical history with their ideas and developments. Today, our products set standards around the world. Our engineers will continue to shape the future actively in our markets, for the benefit of our customers and the long-term success of our company.

1869
1st Voith Francis turbine

1881
1st Voith paper machine

1895
Fish-friendly turbine

1903
Niagara (at that time the world’s largest turbines)

1927
Voith Schneider® Propeller

1929
Voith turbo transmission

1952
Voith Water Tractor, Voith automatic transmission (UIWA®)

1960
Flow brake, flotation deinking process

1978
Itaipu (largest hydroelectric power station)

A world without paper? Unthinkable. More than every third sheet of paper in the world is produced on a Voith paper machine. Voith Paper offers its customers the entire paper-making process from one single source.
More than a third of the electricity generated with hydropower is produced with turbines and generators made by Voith Siemens Hydro. Voith components ensure energy supplies in power stations all over the world.

Drive and braking systems from Voith ensure that people and goods reach their destinations quickly and safely. In a wide range of industries, Voith components operate in all places where energy has to be converted into controlled motion.

The future belongs to integrated service concepts and packages. Voith is one of the largest suppliers of technical services: from maintenance, technical cleaning, engineering through to industrial assembly, process and facility management.

Quality, reliability and soundness are the key concepts of our identity.

These are expressed in: 
**Voith – Engineered reliability.**
Deflection compensating rolls by Voith – reliable technology for a market orientated quality of your paper and board grades
Challenge: CD caliper profile
Voith roll technology for reliable product quality

In the production process of paper and board grades the unavoidable caliper variations in the paper web are a well-known challenge. Especially the differences in the CD profile of the web are a thorn in the paper maker’s side. These variations have to be kept as low as possible to guarantee a constantly high quality of the papers for further processing and sale, respectively.

A consistent thickness of the web is of prime importance for the runnability of the web and the winding of rolls. The more irregularities the CD profile of the web shows, the more it is likely to lead to paper bursts or locally restricted over-stretching of the web due to the addition of layers. Both these web defects have – also due to growing roll diameters – a negative impact on the processing and printing of the paper.
The correction of thickness variations occurring in cross-machine direction gains more and more importance because of increasing quality demands.

To guarantee a consistently high paper quality, Voith offers tools enabling the paper maker to correct the CD profile in specific areas and to make the web more uniform. These tools can be combined and used optimally by the specially developed software. On the one hand there are the Econip deflection compensation rolls, on the other hand there is the Nipco technology with its hydrostatic supporting elements, which is tested and proven for over 30 years.

For every demand Voith’s roll experts specifically compile the fitting technology concepts including the optimal components. High production reliability, long life cycles, a fast return on investment – many considerations finally lead to the right decision for the fitting CD profiling concept.

While the deflection compensation rolls, first and foremost, ensure a uniform pressure over the entire nip width and, therefore, build the basis of today’s high level of calendering, the following text describes the enormous potential of the Nipco technology for profile correction.
Experience and know-how for your production:
More than 30 years of Nipco™ technology

In 1971 the basic idea of today’s Nipco technology was born. Three years later the first Nipco roll operated already in the press section of a paper machine. Today thousands of delivered rolls stand for an enormous experience in different fields of application. It is the know-how collected over the years which permanently leads to new, product-oriented solutions for all kinds of demands.

The first Nipco roll – designed in 1974 for an operating speed of 250 m/min, a line load of 120 N/mm, and a working width of 4,400 mm – is still in use. In 1976 more Nipco products were launched on the market and the fascinating success story of the Nipco roll, which is often and rightly referred to as the “core” of the press and calendering technology, began.

But the use of the Nipco technology goes far beyond the field of the paper industry. From the printing of floor coverings, the rolling of sheet steel, the grinding of food up to the refinement of fabrics – the possibilities of the Nipco roll seem to be endless. The range of experiences gathered here leads to today’s state of Nipco technology: a reliable, efficient and precise tool for the paper maker.

During paper production Nipco rolls have an effect on the paper in the different stages of paper making: In the press section the web can already be run over several Nipco rolls. Other application areas for Nipco rolls are pre- and machine calenders, soft calenders, and multi-roll supercalenders. And finally printing: The printer e.g. uses a Nipco-Print G03-DC to achieve a perfect print without missing dots.

From an ingenious basic principle to a reliable profile correction

There are three main elements distinguishing a Nipco roll: the fixed shaft, the roll shell, and the hydrostatic supporting elements. These are built into the shaft and support the rotating roll shell on its inner side against the exterior load. In the classic Nipco roll the supporting elements are controlled in zones. Due to this, reliable individual line load curves can be realized over the entire width of the nip – even with extremely low line loads.

Nipco™ rolls are not only used in the paper industry but also in many other industries.

1. Paper
2. Gravure printing: publication
3. Gravure printing: decor printing / packaging printing
4. Gravure printing: floor cover printing
5. Lamination / foil finishing
6. Thermobonding
7. Textile / specialty calenders
8. Panel board presses
9. Metal rolling
The Nipcorect roll is in fact even further developed. For the operator it offers an enormous potential for correction of the web’s CD profile because the supporting elements of this roll type can be controlled individually. For this very reason the modern and highly flexible shell systems of those rolls can show their full potential as only a precise fine profiling is made possible due to their properties.

**Concentrated Nipco competence to the customer’s advantage**

Since the year 2000 the entire Nipco activities are concentrated at Voith Paper in Krefeld, Germany. All information meets here: the latest insights from the R&D – departments of the Voith group, the response of the paper industry, and from the Voith experts on site. The Nipco-experts in Krefeld are able to fall back on this “pool of competence” to become the customer’s qualified partner during order processing, for service, and for new developments.

The history of the Nipco roll is a success story with over 10,000 rolls delivered world-wide. The modular Nipco design offers roll systems for widths over 10,000 mm, speeds up to 2,500 m/min, and line loads up to 550 N/mm.

Nipco technology today – this means solid, safe, reliable and maintenance-friendly concepts, which, custom made for the operator, provide the necessary correction potential for an optimal quality insurance of their production.

The basic principle of controlled support elements is the foundation for individual line load curves in the nip.

The acquired Nipco™ know-how is concentrated in Krefeld and ensures an on-going development and improvement of our products.
From Econip™ to Nipcorect™:
The most suitable roll for every CD profiling task

The CD profile variations of the web can be roughly divided into three categories: long wave inconsistencies in the range of 1,500 mm, short wave inconsistencies at about 300 mm, and very short wave disturbances in the range of 150 mm or less. Voith’s technology offers perfectly matched tools for every specific requirement and the actually required degree of correction.

Table of supplied rolls arranged according to speed and width

The quality demands of the finished paper are decisive for the right profiling concept.

Steadily increasing quality demands, working widths, and operating speeds require market oriented technologies which guarantee a maximum of production reliability. A survey of profiling and deflection compensating rolls delivered until now reveals how extensive the entire field of application is that Voith’s roll technology covers. The diagram above shows what is appropriate and possible in CD profiling correction. For an optimal correction potential it is recommended to select a combination of different machine and control components.
**EcoNip™ rolls – the mastery of nip forces**

The original basis for a reasonable CD profile of the paper is the compensation of roll deflection. Nowadays, EcoNip rolls ensure that nip forces remain constant over the entire nip width in many calenders.

An oil filled pressure chamber inside the roll causes the deflection compensation; but by changing the pressure in the chamber one can achieve a correction of the deflection line also: To a certain degree, increased pressure can be used on the roll center or the critical edge zones.

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**Nipco™ and Nipcorrect™ – for a precise CD profile correction**

The profiling rolls equipped with Nipco technology have been developed to precisely correct long wave or short wave CD profile differences. Zone controlled Nipco rolls – up to 16 zones depending on the design – are the ideal choice for corrections in the long wave range of about 1,500 mm. The optimal number of zones and their width is determined depending on the working width of the equipment.

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*Images of EcoNip™ roll with pressure chamber and Nipco™ roll with supporting elements.*

*Profiling potential of a Nipco™ roll with 10 separate zones (top scheme) respect. 48 zones (bottom scheme).*
Short wave CD profile disturbances are best corrected by Nipcorect rolls. Since the supporting elements in the shaft of the roll are controlled individually, profile corrections can be carried out in the range of 150 mm. In combination with our ProfilMatic control software for determining the optimal set value changes, excellent CD profiles can be realized. An additional ModuleTherm (as additional actuator element) can be included in the correctional process if even narrower correction ranges are necessary.

The newest developments in Nipco technology once more set new standards concerning profiling potential and production reliability. Our two new, modular designed versions of the Nipcorect roll can be adjusted exactly to the technical guidelines of the production environment.

For a broad variety of application in the middle range of working widths and speeds a version with narrow supporting elements mounted close together and with special flexible shells has been developed. This type of Nipcorect roll distinguishes itself through an extremely sensitive CD profile control which has exceeded all expectations of the new concept during practical mill operation.

The modular type of the Nipcorect™ roll is available in various dimensions.

Thinner roll shells in combination with closely arranged narrow supporting elements result in an enormous profiling potential of this type of Nipcorect™ roll.

Nipcorect™ roll with thin shell
The latest member of the Nipcorect roll family is a design which was specifically developed for increasingly faster machines with increasing working widths. In this version, the guide bearing was integrated into the gear unit; this leads to a significant reduction of the bearing’s center line distance and is, therefore, excellently suited to optimize existing equipment. Besides the new arrangement of the bearings, the gear teething has been optimized resulting in smoother operation. It is a particular advantage of the new solution that in case of a power failure the shell of the Nipcorect roll will be supported by the integrated guide bearings so that the hydrostatic elements won’t get damaged.

**Safe CD profile correction** – even with increased production demands

With the use of Nipco profiling rolls a remarkable improvement of the caliper profile can be achieved. The optimal system for CD profile regulation at present is a combination of Nipcorect roll, ProfilMatic controls software, and ModuleTherm. The change to this control technology led to two sigma values in the range of 0.28 and 0.18 µm, measured in a calender finishing copy paper – a result never achieved with any other control strategy.
Reliable in daily operation:
Proven technology with a guaranteed future

Voith’s technology take the demands of product and production, market reality and market development, customer specific and global aspects into consideration. And only a machine supplier like Voith Paper who knows every single step of paper production from scratch can guarantee a reliable inter relation of all components and technologies.

For a complex technology like the Nipcorect roll, reliability and a maximum amount of operational safety are fundamental conditions for the use in production. Voith Paper, for instance, has developed a new system for the tube bundle which controls the individual hydrostatic support elements. This rigid and simplified design with less components and a newly designed sealing system increases the life cycle and makes maintenance work easier.

With the new Nipcorect version which possesses an increased deflection CD profiling potential because of thinner roll shells and narrower supporting elements, Voith found it especially important to make handling it easier and safer. The special cartridge-bearing of the roll in combination with a fast de-coupling Nipco head unit shows the customer orientation and high user friendliness of this design concept which, therefore, represents an ideal component for system optimization as well as for productivity- and quality increases.

Customer and practice orientation in every detail

The high productivity and practice orientation of the Nipcorect technology reveals itself during restarts e. g. after a web break. Whereas conventional external procedures for correcting the paper profile need up to 20 minutes to regain the former performance, Nipcorect already reaches its full correction potential in 1 minute after the machine has been restarted. The production can be continued much faster and with the usual quality.

The necessity to continuously supply all supporting elements with pressurized oil leads to a drastically increas-
ed power consumption because of higher speeds. The scooping technology of Voith makes it possible to reduce the energy use up to 50% due to a fast return flow of the roll’s oil.

All data under control: the CalTronic™ control concept

To fulfil the diverse tasks of a Nipco roll in a calender and at the same time make the most of its enormous potential, an intelligent and flexible system control is required. With CalTronic Voith offers a modular control concept which comprises – besides the operating and the network level – proven components for the machine control, the information systems, the process controls as well as a system for measuring and monitoring of paper quality.

The NipcoLogic is a special element of our CalTronic software. It controls the Nipco roll and calculates the necessary roll control variables for line load and deflection compensation. To achieve an optimal CD profile, a closed loop control called ProfilMatic is used. This considerably fast system accurately recognizes differences in the web’s CD profile and eliminates them effectively through the Nipco system.

The status quo is recorded by online measurement, the necessary line load differences for the caliper correction are calculated via ProfilMatic and passed on to the NipcoLogic afterwards. The NipcoLogic continually calculates the actual hydraulic pressures for conversion of the optimal line load over the entire roll width. The machine control ensures the hydraulic conversion and at the same time supervises all the set parameters. The result of the changed deflection line of the Nipco-rect roll immediately shows itself in the paper and constantly ensures the desired paper quality.

The ProfilMatic™ closed loop system is based on a multi-actuator control strategy. On the basis of the recorded actual CD profiles, ProfilMatic™ continually calculates the line load differences necessary for CD profile corrections.
Process experience and reliability:

Product competence and service from one source

Due to its position as the worldwide leading supplier of optimally balanced process technologies, Voith also fulfills the demands as far as the components of roll technology are concerned. In addition to new technical developments such as the new Vantis covers, the extensive services available from Voith ensure a productive and cost-efficient operation of machines.

Custom made covers for an optimal roll surface

The optimal design of the nip is of essential importance for the desired paper quality. Depending on the hardness of a Nipco roll cover the dwell time of the paper in the nip is shorter or longer. This leads to the desired influence on structure and surface. Soft covers naturally cause a wider nip with a longer dwell time whereas hard covers stand for a shorter dwell time as well as a higher nip pressure.

Examinations of the wear behaviour of different materials during different paper compression led to a new generation of covers which is outstanding due to a considerably better adherence at the roll core and an abrasion resistance with clearly decreased “volume loss”. There are three versions of Voith’s new Vantis covers at the moment, which are specifically developed for the demands of the different calender technologies – Ecosoft, Janus, and existing supercalenders. They are available in three grades: 88, 90, and 92 ShD. SofTec covers with a reduced hardness of 70 ShD can be used for special papers or board because they are very bulk preserving.

The hardness respectively softness of the cover is important for the profile correction with the Nipco or Nipcorrect roll, too. The new Nipco-
rect version with the thinner roll shell can only make full use of its high profiling potential if it is combined with an appropriate soft but still resistant cover.

The customer’s demands will be the deciding factor for the choice of the suitable roll cover. Many criteria have to be taken into consideration: furnish, fillers, product guidelines but also technical aspects such as nip pressure or nip frequency. To ensure perfect results our roll experts have modified the available covers for the prevailing product profiles. Due to this we are able to optimally build the nip around the products of our customers.

To achieve optimal calendering results it is definitely not sufficient to expose the paper to pressure and temperature for an extended time. Only if the surface structure of the heating roll meets the highest demands concerning the surface topology, it is possible to produce first class paper. To maintain this surface despite of abrasive stress as long as possible, Voith offers a wear resistant coating of the hard roll consisting of tungsten carbide. This coat was named CeraCal and has been further developed to CeraCal Plus in the meantime. It guarantees an excellent surface smoothness during long production periods and over and above prevents roll wear in the area of the web edges.

In this way, paper of constantly high quality can be produced for a long period of time. Contrary to a chromium coating this coating allows the use of a doctor blade without causing any problems so that positive results are achieved where stickies normally are a problem.

Competent service around the clock

The services offered by Voith guarantee availability of the technology and of the components as well as fast help for our customers. This already starts in the project phase. Our R&D experts select every single roll with regard to roll type, number of zones, cover, and size according to the customer’s specific requirements.

There is a strict quality control during manufacturing. Every roll has to undergo a test run on the test bench in Krefeld prior to delivery. Here the tightness of the roll body and the essential functions are tested. The commissioning on site as well as the training of the operators are further services guaranteeing a high degree of safety and reliability of the supplied rolls.

Voith is a reliable and competent partner also while the customers are producing paper and board. In emergency cases our “Help Desk” can be contacted by phone around the clock. A team of employees from our service department – each of them with many years of experience – can directly present suggestions or work out solutions at short notice.

Voith’s range of services, of course, comprises also rebuilds and modernizations. It is possible to upgrade existing Nipco rolls with Nipcorect technology to realize increasing quality demands even on existing equipment.