PRÜFTECHNIK

keeps your world rotating

Geometrical Plant Alignment using Modern Measurement Technology

An increase in production speed in web-conveying plants while complying with the quality requirements requires the precise geometrical alignment of the plant.

Parallelism of the rolls among one another is as important as perpendicularity of all rolls to the reference axis of the machine. Modern measuring methods for geometrical plant alignment are explained in the following.

Why do we measure parallelism?

Rolls in web-conveying plants define the direction of the material flow. This applies to the material as well as the clothing. Non-parallel rolls cause a transversal force FT leading to asymmetrical tension of web and clothing (see figure 1). This leads to paper tears, wrinkling, and frequent wire replacements.

How can roll parallelism be measured?

Just 15 years ago, prior to the introduction of PARALIGN® into the market, theodolites were mainly used for measuring roll parallelism. However, optical systems quickly reach their limits in industrial environments, as a visual connection to the objects to be measured is required at all times.

PARALIGN® enables the measurement of up to 80 rolls per day with consistently high precision.

What is PARALIGN®?

PARALIGN® is a measuring device utilizing aerospace technology in web-conveying plants. The device features three ring laser gyroscopes. Ring laser gyroscopes are high-precision graphometers. The orthogonal layout of the three gyroscopes establishes a three-dimensional coordinate system describing the three degrees of freedom (roll, pitch, yaw) of the roll (see figure 2).

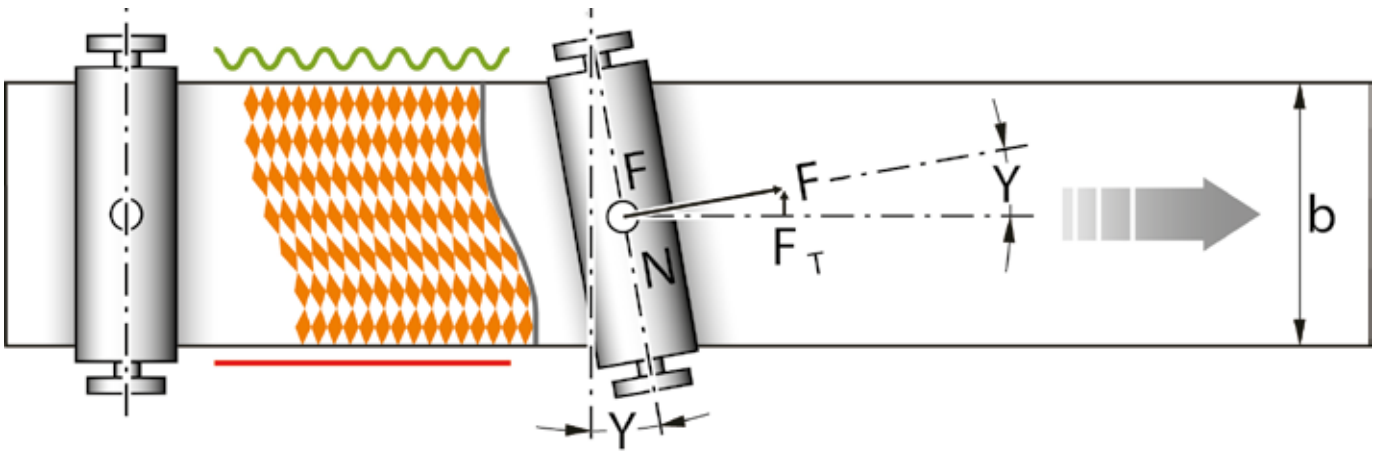


Figure 1: Force distribution due to non-parallel roll alignment

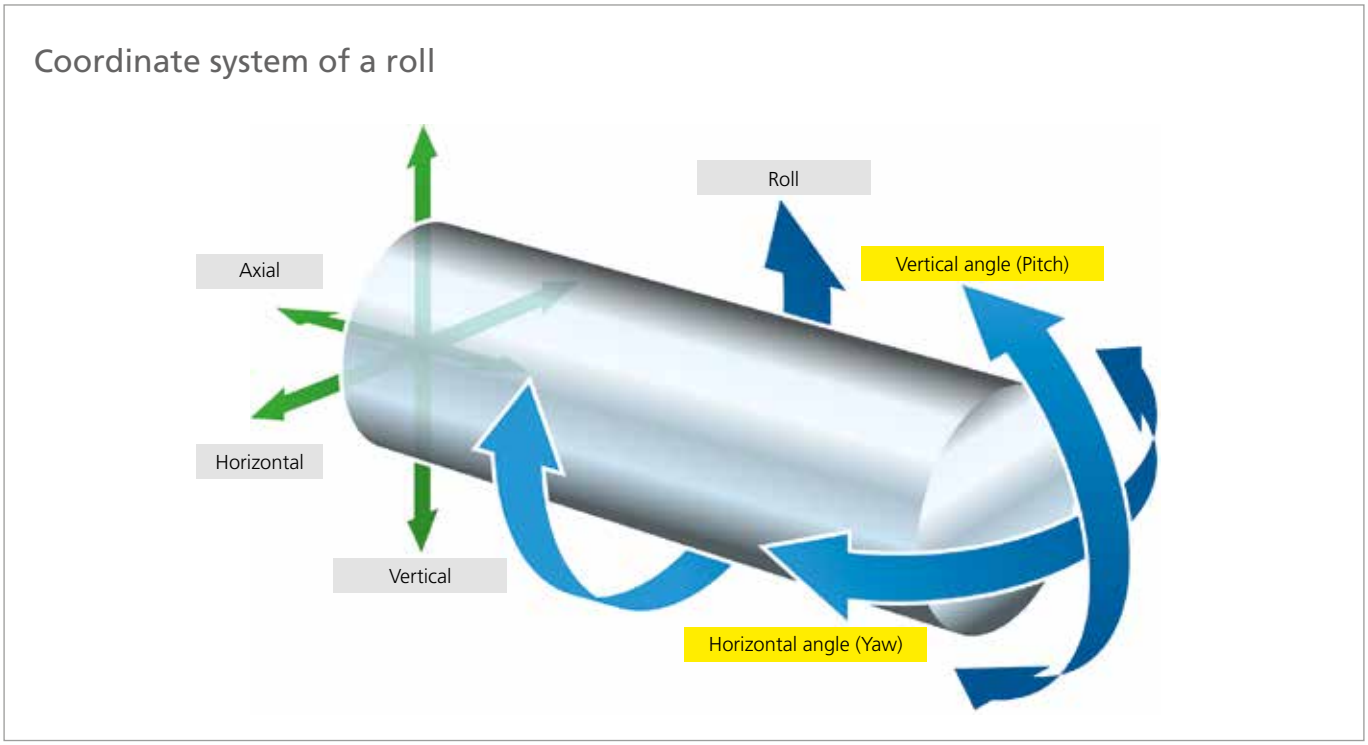


Figure 2: Coordinate system of a roll

How does the method work?

PARALIGN® was developed for measuring roll parallelism. For measured value acquisition, the device – as shown in figure 3 – is simply placed on the roll shell and moved along its surface over a pitch circle around the axis of rotation. Using this movement, a measured value bundle is acquired that is used by an algorithm to calculate the axis of rotation of the roll in the three-dimensional space.

Conducting such measurements on several rolls allows the presentation and comparison of the axes of rotation of the rolls in a comprehensible report.

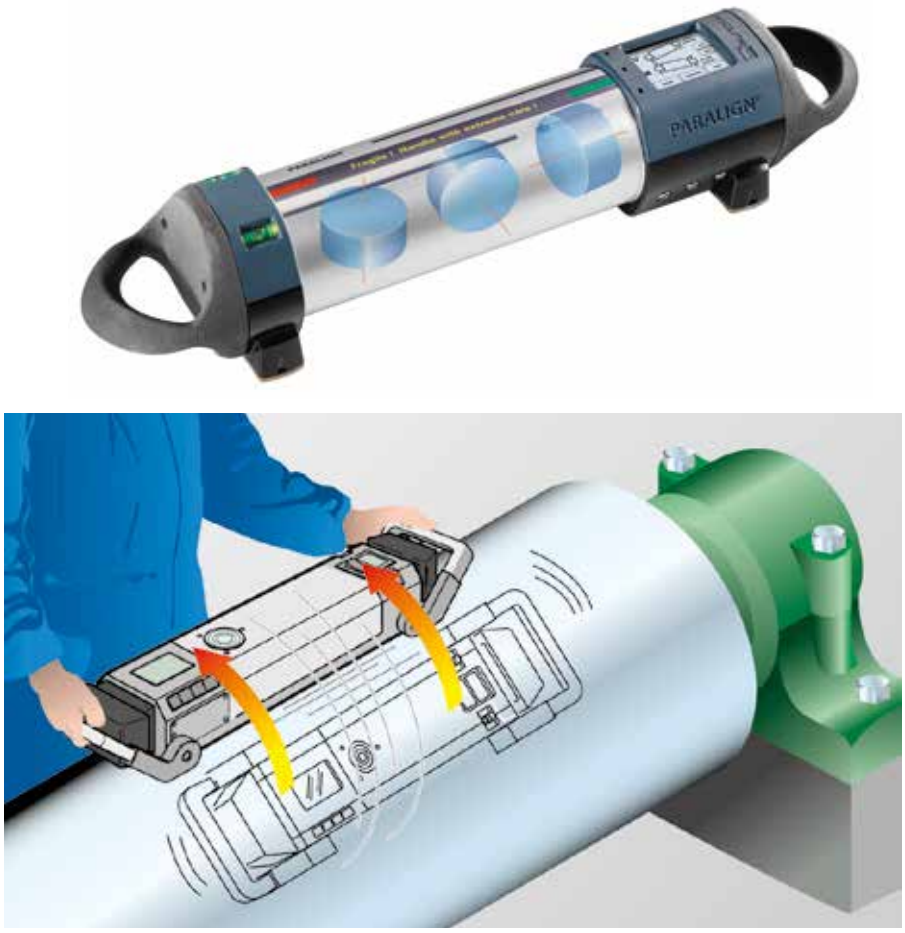


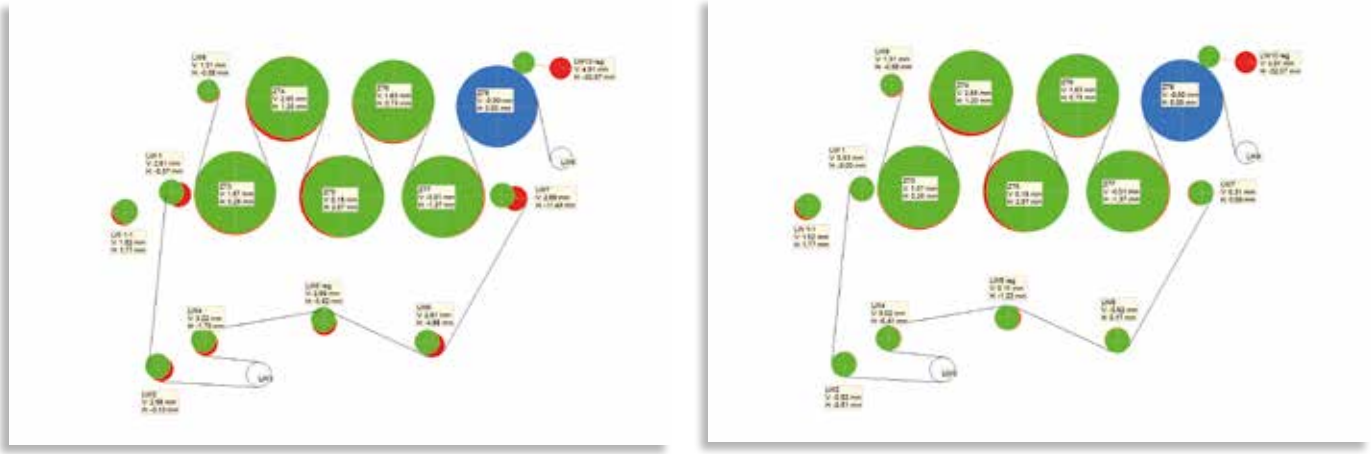
Figure 3: The patented sweep mode: PARALIGN® is moved along a pitch circle on the surface of the roll shell for measured value acquisition.

A real-life example

The wire rolls of a post-drying group were replaced. The PARALIGN® service offered by PRÜFTECHNIK was used for verifying roll parallelism. The newly installed rolls were measured, aligned, and their alignment state documented within a few hours. Figure 4 presents the measurement results before and after alignment.

The observer is positioned on the operator's side of the machine, represented by green dots. The red dots represent the machine side of the roll; the blue dot is the selected reference roll that is perpendicular to the drawing plane.

Figure 4: PARALIGN® report of a post-drying group.
Left: Measurement result before correction; Right: Measurement result after correction.



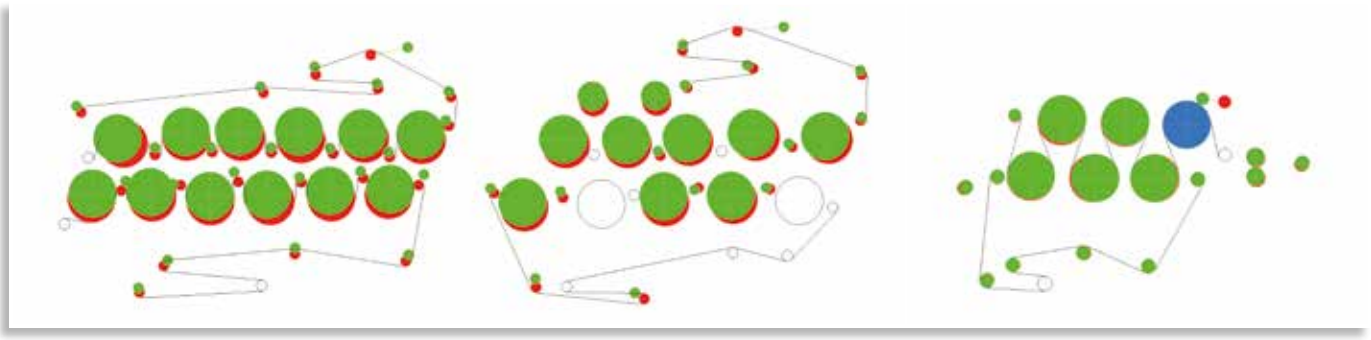
Why can we not use a theodolite?

As in this case – as so often – this is not possible. Just as modern tracking interferometers and electronic tachymeters, theodolites are optical measuring systems that require a visual connection to the rolls.

This results in enormous restrictions. The time effort should not be underestimated either: A trained optical engineer can measure 6 to 8 rolls a day using a theodolite. PARALIGN®, on the other hand, can completely document up to 3 drying groups within a day (see figure 5).

The time for roll corrections during this service appointment was also used to document the alignment state of further drying groups. The qualitative result is presented in the following figure.

Figure 5: PARALIGN® report of the three drying groups



How to select a reference roll?

PARALIGN® can measure rolls relatively to one another and compare the spatial vectors of the axes of rotation. However, which roll should be used as reference?
The reference axis should be perpendicular to the machine axis. For this purpose, a laser-based method was developed for determining the horizontal position of a roll relative to the reference axis of the machine. The disk laser is calibrated parallel to the available floor markings. The headbeam that is precisely vertical to the rotating laser records the measurement points on the operator's and the machine side of the roll. Therefore, the horizontal position of a roll relative to the reference axis of the machine is clearly determined and can be implemented in the PARALIGN® report.

Author:
Michael Vasiliev, Sales and Applications Engineer, PRÜFTECHNIK Condition Monitoring GmbH

About PRÜFTECHNIK

The PRÜFTECHNIK Group, with its subsidiaries and partners in more than 70 countries worldwide, continues to set new standards with innovative technological advancements in the field of machine alignment and vibration measurement technology in order to maximize and optimize the operational safety of machines and plants.

Press contact

Anne-France Carter
Tel.: +49 89 99616-235
anne-france.carter@pruftechnik.com

PRÜFTECHNIK
Condition Monitoring GmbH
Oskar-Messter-Str. 19-21
85737 Ismaning, Germany
www.pruftechnik.com