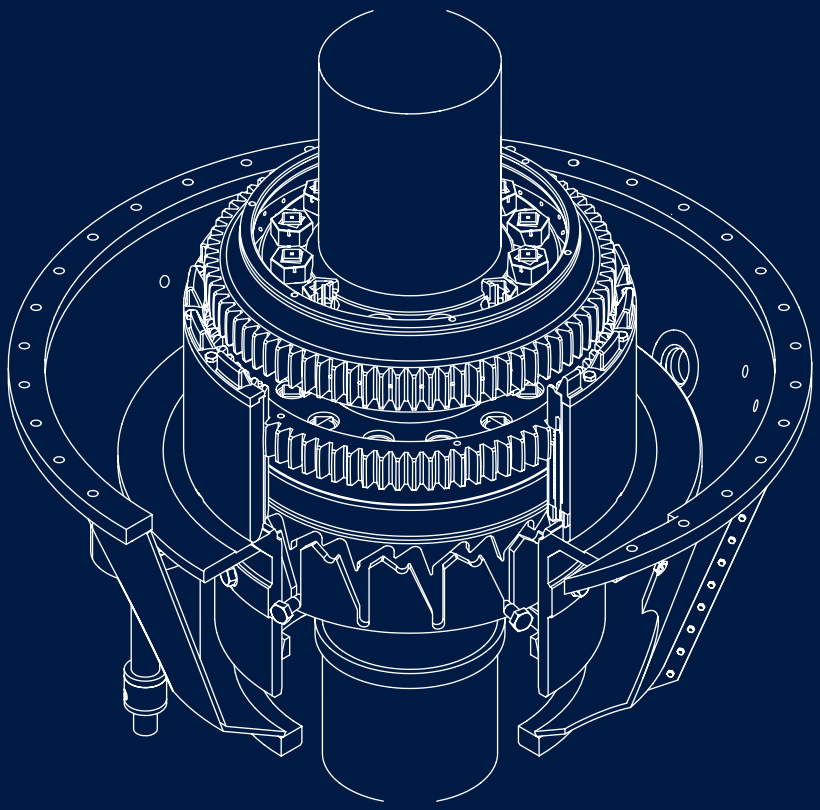
RENK

Innovative Power Transmission



Curved-tooth couplings®
for pumped storage power stations

RENK Propulsion Technology from Rheine
Ideas – Solutions – Outlook

Propulsion technology has a name: RENK. RENK AG is one of the world's leading manufacturers of propulsion technology and testing system components. The company is the world leader in the sectors of slide bearings and Navy gear units.

This success comes from 140 years of experience and development work in the area of propulsion technology, and from the technical skills of more than 2,200 employees worldwide who contribute their commitment, creativity and love of technical detail to helping RENK AG solidify and further expand its leading position in various markets.

The RENK plant in Rheine specializes in producing various models of gear units and couplings. Here, in addition to producing a wide range of all-steel couplings, more than 480 employees develop and manufacture marine gear units for tankers, container ships and ferries as well as high-speed turbo gear units for industrial plants and gear units for 5-MW offshore wind farms.

RENK couplings are used in every industrial sector. Our range of couplings is the most extensive in the world. The large number of model ranges and versions gives you enormous freedom in designing shaft connections – we offer the perfect couplings for even the most difficult applications.

No compromises when it comes to quality – this guiding principle applies to every part of our company, from the first planning meeting to product development, production and controlling.

In the area of pumped storage power stations, RENK relies on experienced experts who are able to develop, build and install complex couplings for new niche markets.

The Rheine plant features modern manufacturing plants; its spacious hall architecture and clever logistics paths ensure that all of the products are optimally processed.

The world's largest planetary gear was assembled in the Rheine plant, and then underwent various testing processes on the test bench.

Test benches and simulations for every product manufactured by RENK are another way in which we guarantee quality.

Curved-tooth couplings® for pumped storage power stations

Gigerwald dam

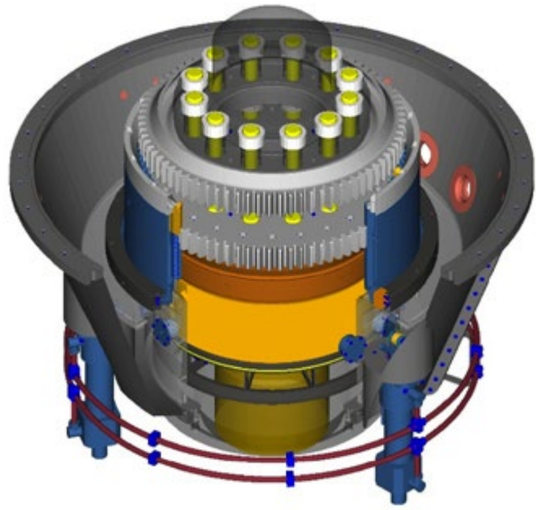
The proportion of renewable energy generated from wind and solar power is expected to keep increasing dramatically over the next few years. The disadvantage of this type of energy is that power cannot be generated at the specific times when it is needed. As a result, the demand for enormous energy storage units is constantly increasing. One proven storage option are pumped storage power stations. Many of the existing pumped storage power stations have been in operation for more than 40 years already, and will need to be renovated in the next few years.

There is not enough storage capacity, so it makes sense to build new pumped storage power stations in Europe. The corresponding output will range from 360 to 3,000 MW.

Pumped storage power stations are used to cover power needs during peak hours and to regulate the power grid. The power plant can be made available through the grid within a few minutes, and can be regulated very flexibly. The required output can be directly converted to electricity through the turbine and the generator, using the stored water.

In the event of excess power in the grid, the electricity is fed into the motor that drives the pump, which then refills the reservoir.

The best solution. Switched curved-tooth coupling®



Vertical switched coupling for the Mapragg power plant, Switzerland

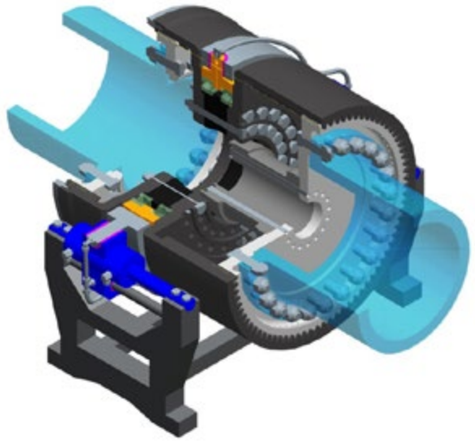
Most of the tooth couplings installed in drive trains for pumped storage power stations from the 1950s to the 1970s were equipped with straight teeth, and the shell with internal teeth was often supported by one of the drive shafts. There was no way to compensate for a radial offset in the machine drive shafts.

RENK's curved-tooth coupling® offers a huge advantage here. As a rule, RENK's curved-tooth coupling® uses a double-cardanic design that allows radial, axial and angled offsets in the machine drive shafts to be balanced out.

The shell floats freely on the hub and is able to balance offsets in the machine drive shafts in every direction. The curved-tooth coupling means that the teeth and rim supports inside the teeth cannot get stuck, and ensures easy engagement and disengagement at all times. A change in the orientation of the coupling, e.g. due to a sagging foundation, does not change the coupling's operating and switching behavior.

The couplings are lubricated via injection lubrication. One benefit of this injection lubrication is the constant addition of fresh oil, which also cools the coupling. The addition of fresh oil also ensures that any particles in the lubricant are rinsed out of the coupling and can be filtered out later.

Tailor-made for every application

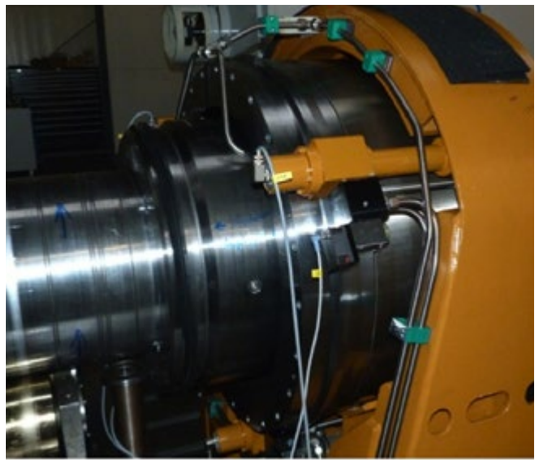


Horizontal switched coupling for the Obervermuntwerk II power plant

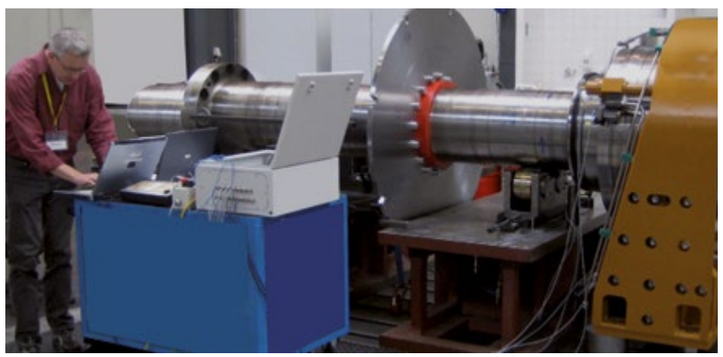
RENK offers tailor-made couplings, in both horizontal and vertical formats. Our curved-tooth couplings® are not limited to new plants. RENK has proven that the curved-tooth coupling can also replace worn-out tooth couplings in existing plants, and that the benefits of the curved-tooth coupling apply just as well to these plants.

Switchgear
A switchgear designed for the needs of the plant is included with the coupling. Both pneumatic and hydraulic switchgears are possible. The switched coupling controller is perfectly integrated into the existing controls for the overall plant. If needed, a separate controller can also be provided for the switched coupling.

The switchgear not only engages and disengages the coupling, but also prevents uncontrolled engagement and disengagement. Sensors are integrated into the switchgear that transmit the switching situation to the plant controller.



Simulating the switching process on the test bench



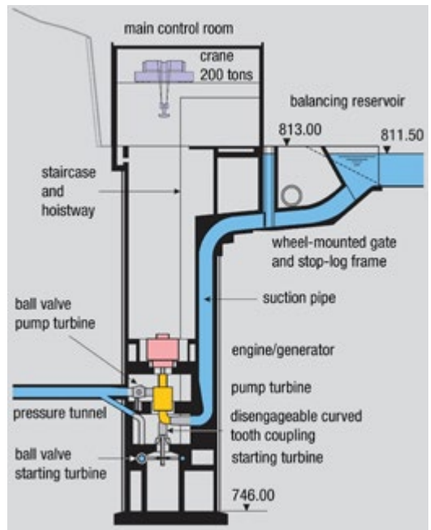
Selected references

View of the Löbbia power plant, Switzerland

References for new constructions and retrofitting:

Plant:

• *Nestil*	*Andritz Hydro Germany*
• *Mapragg*	*Andritz Hydro Switzerland*
• *Löbbia*	*Andritz Hydro Switzerland*
• *Ferrera*	*Rainpower Norway*
• *Obervermunt II*	*Anfritz Hydro Austria*



Cross-section of the Nestil plant with a vertical Switched coupling.

We have close partnerships with the following plant engineering companies for new construction and retrofitting projects:

Alstom Hydro
• *Grenoble France*

Andritz Hydro
• *Kriens Switzerland*
• *Linz Austria*
• *Ravensburg Germany*

Rainpower
• *Kjeller Norway*

Voith Hydro
• *Heidenheim Germany*

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