

Cylkro® Face Gear Multiple Drive Systems with High Efficiency

Numerous technical applications require simultaneous adjustment of several similar elements. This facilitates the efficient use of a single motor for parallel operations as well as the alignment of several elements.

Meaningful examples of multiple drive systems in the field of renewable energy are the alignment of blades for windmills and tidal power plants as well as the inclination of solar panels. The efficiency for the power generation is significantly increased because of the continuous optimised alignment.



Picture 1: The blade alignment of tidal power plants generates a considerably higher energy yield.



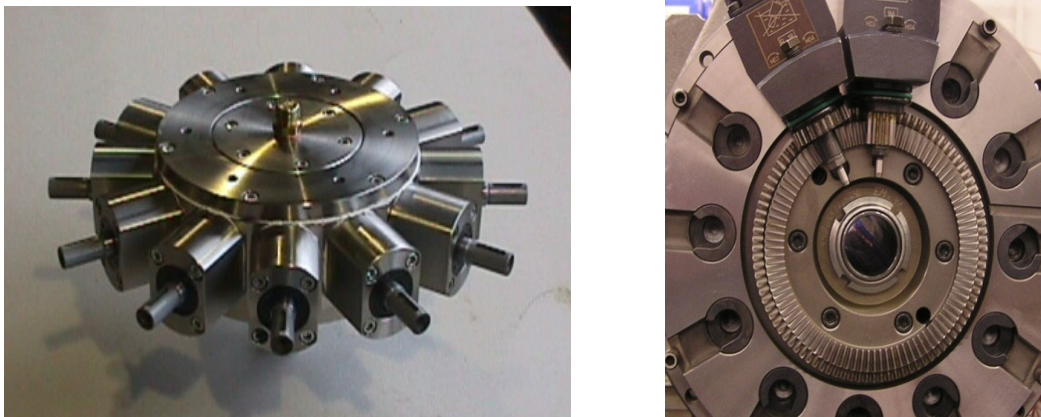
Bild 2: Face Gear Units are also being used in wind plants and water wheels.

Face gear transmissions are destined to be used in these kinds of applications: several spur pinions are positioned on one face gear, its efficiency comparable with that of a spur gear transmission and as such very high (>95%). Mounting is considerably easier compared to traditional angular transmissions, since the pinions can move freely either way in axial direction without affecting the contact pattern. The cost of mounting can be reduced and mounting errors can be eliminated. In addition, the transmission is proof against temperature or stress related expansions.



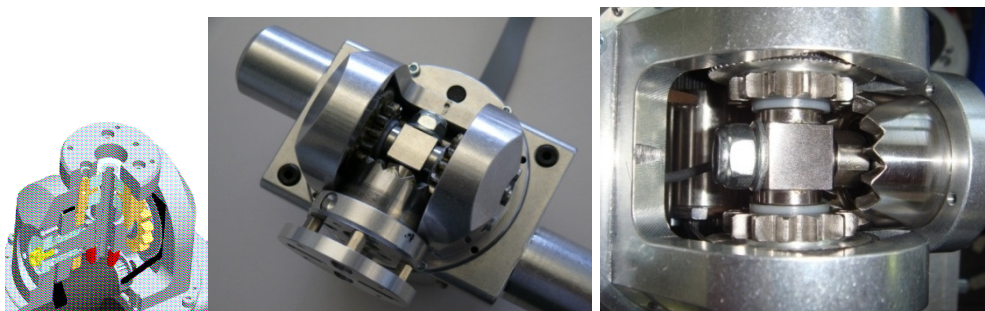
Picture 3: Face gear set (left) and an Evolvere® “Flat Drive” angular transmission allowing multiple drives.

Swiss based ASSAG is market leader in the field of face gears. The patented Cylkro® face gear technology is used worldwide and is known for its optimised tooth form as well as high production quality. The ASSAG Evolvere® quality trade mark covers both a range of angular face gear drives as well as customer specific transmission solutions.



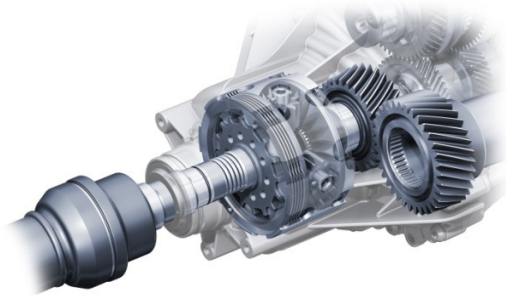
Picture 4: Examples of Cylkro multiple drive applications

Face gear drives allow single stage transmissions of 1:1 up to 1:20. Multiple drives in parallel driven tools (picture 4) and robotics (picture 5) are further examples of the meaningful use of multiple driven or driving systems.



Picture 5: Face gear multiple drive for robotics actuator (3D model, top view and face gear transmission). When both pinions move simultaneously, the end effector rotates around the main shaft over the face gear, otherwise it performs an additional self rotation.

The mentioned advantages of face gear technology are more and more applied to differentials as well. The two face gears, which enclose the pinions, can have a different number of teeth. This allows adjustment-free unsymmetrical load distribution. The new Audi Quattro RS5 is the first to introduce this face gear center differential.



Picture 6: Center differential in Audi Quattro RS5, using two Cylkro® face gears and four pinions.

Such differentials are not just used in the automotive field, but in any such application which requires distribution of load or synchronisation of processes.

The ASSAG transmission range includes many other types of transmissions, from high precision Harmonic Drive miniature drives up to large scale transmissions with power input exceeding 1000 kW.

Face gears offer the following important advantages:

- Axial freedom of the pinions
- Gear ratios of 1:20 in a single stage
- High efficiency
- Possibility of large hollow shaft
- Low oscillating mass
- Free choice of axis angle
- Unaffected by temperature influences
- Possibility of head bearings for vibration damping
- Last but not least: Cylkro-Evolvere® is a low-cost angular transmission to fulfil high demands

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