Technical note T146: Green credentials

Taylor Hobson alignment products help manufacturers meet their green credentials

Renewable energy must be the way forward, whether it is tidal, wind or nuclear. Alignment products from Taylor Hobson are helping to develop and improve manufacture and efficiency of this technology.

Alignment of shaft and gearbox on wind turbines using the Micro Alignment Telescope

Figure 1

It is now projected that 10% of the world's electricity will be generated by wind power within 20 years. For wind farms, maintenance challenges are enormous. Experience shows that up to 25% of the costs of energy produced by wind energy converters or wind turbines can be attributed directly to maintenance.

The larger the turbine, the more critical the installation and maintenance – for example, the world's largest wind turbine went onstream in Germany in 2005; its huge rotor weighs more than 100 tons which exerts tremendous loads on the rotor shaft.

The correct alignment of the generator shaft to gearbox is crucial and not only prevents wear and damage but also improves efficiency. With the Taylor Hobson Alignment Telescope we can generate a straight line datum and then put things in line. We can also then put the telescope square to a component, gearbox or drive system. Even though couplings are used the rule of thumb should still be that the alignment is made with an accuracy of around one third of the coupling working range.

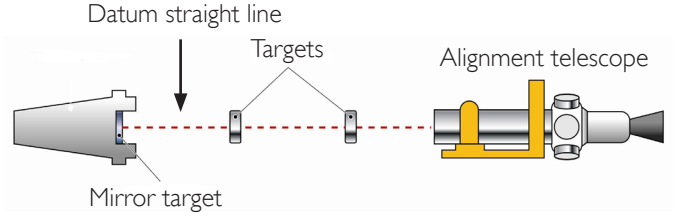


Figure 2 – the basic principle used

Parallelism and flatness of bearing rings on wind or hydro electric turbines using the Talyvel Electronic Level

Measurement of guide bearings (large or small) for flatness and parallelism can be measured using a very accurate electronic level.

The alignment and level of the support bearings for a turbine are critical to its performance and durability. The life of the turbine, the noise generated and the efficiency of the system are all greatly affected by accuracy of the support faces within the turbine housing.

Historically, Taylor Hobson Electro-Optical equipment has been used to measure flatness of many varieties of engineering assemblies, from surface tables to large machine platforms. Flatness can be measured using a combination of Electronic Levels, Autocollimators and Micro Alignment Telescopes, depending on the application. The challenge here was to measure the flatness and parallelism of two very large annular bearing faces, machined in to the wall of the turbine. The requirement was to measure the Flatness of each annulus, the tilt of each one relative to absolute horizontal (gravity) and the parallelism between the two surfaces.

Special software was used to provide a datalogging facility, parameter calculation and data storage from measurements made with the Taylor Hobson "Talyvel 6" Electronic Level.

Using the Talyvel to collect two continuous annular sets of data (upper and lower), multiple measurements were taken around the circumference of each ring.

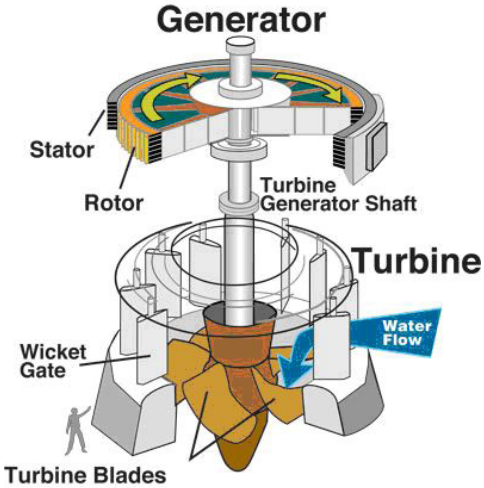


Figure 3

Measurement of turbine blade angle using precision clinometers

Clinometers like the one shown here can be used to very accurately measure blade angle. This simple yet high accuracy clinometer has a large measurement range (+/-45 degrees) and can be set to absolute or relative zero.

Figure 4

Other applications – nuclear industry

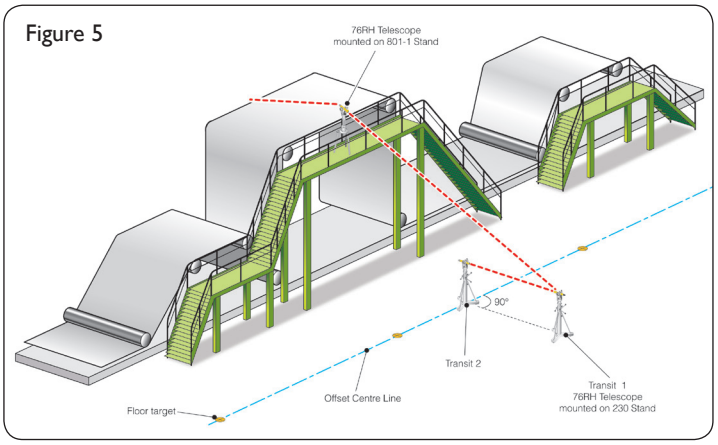
We have been involved for many years in civil engineering projects in the nuclear industry for monitoring and building construction projects for level, movement, alignment, squareness and parallelism.

For example, when constructing a nuclear power station it is critical that a grid of standpipes are all set truly vertical and that the refuelling rods are guided into the reactor core without touching the sides of the standpipes.

The Micro Alignment Telescope in conjunction with the Talyvel electronic level can set a straight line datum referenced to gravity either truly horizontal or truly vertical.

Setting and checking of web/roller alignment and parallelism

Figure 5



The use of light-weight, rechargeable and flexible solar cells (figure 6) is becoming more common for powering laptops or mobile phones as well as military and space applications. These flexible cells are made of layers of material that are produced on large roller systems like the one shown and manufactured in a similar way to clothing and paper. In this application however the many layers must be produced and sandwiched together to make the rechargeable solar cells.

It is critical that all the layers are square and parallel to each other to ensure the necessary quality and adhesion. Using a range of alignment and level equipment, the various rolls can be quickly checked for squareness, level and parallelism (see figure 5).

The system also allows, when set up correctly, extremely high production throughputs thus reducing manufacturing costs.

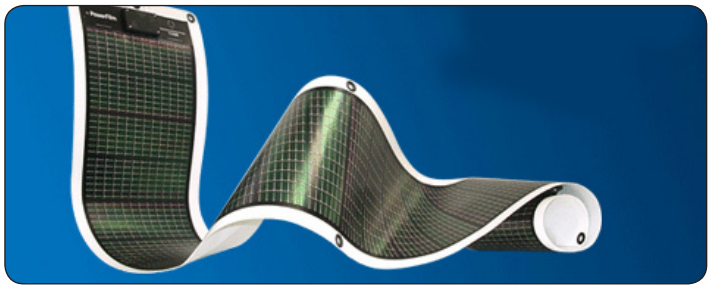


Figure 6

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