Integrated Load Cell for torque measurement and monitoring of Gearbox

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BHARATH P. & THIRUMOORTHI T.

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Bonfiglioli

Serves more industries and applications than any other drive manufacturer

Over 1 million

gearboxes and gearmotors manufactured per year

Widest range

1 in 3 wind turbines has a Bonfiglioli gearbox

Market Leader

Widest range of final drives on the market

INTRODUCTION
BONFIGLIOLI

- Bonfiglioli Transmissions India was established in the year 1999
- Bonfiglioli Transmissions India designs and produces planetary gearbox systems for nacelle yaw control and blade pitch control.
- **9** out of our every **10** windmills in India uses a Bonfiglioli Wind Energy gearbox, making the company a preferred worldwide supplier to the wind industry.
- Over 12 million Euros of global investment in R&D
- Over 100 employees in R&D globally
- 5 research labs
- Academic collaborations:
  - Modena
  - Bologna
  - Aachen
  - Chennai
  - Shanghai

WHAT ARE WE GOING TO LEARN?
INTRODUCTION

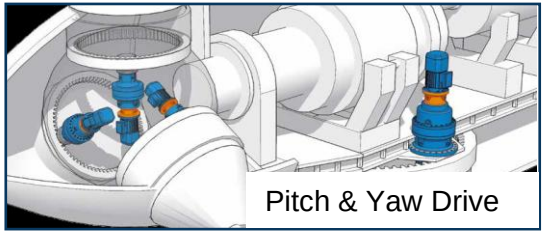
Torque is an important mechanical parameter to be measured during the working of any gearbox for various applications,

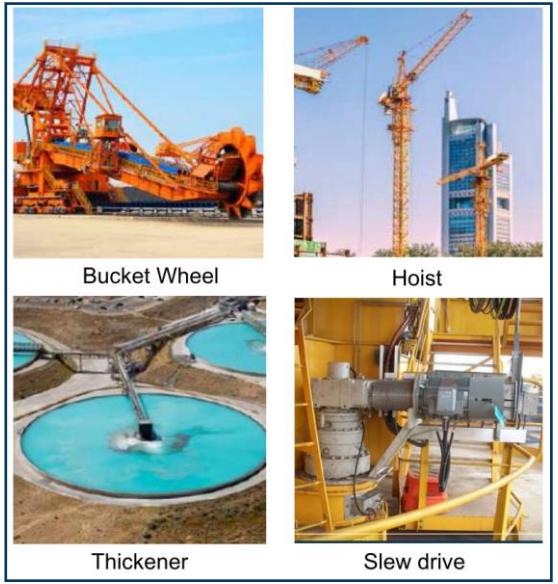
Right from **yaw** and **pitch** drive to crane, industrial, winch and so on.

The necessity to measure the torque exclusively, when:

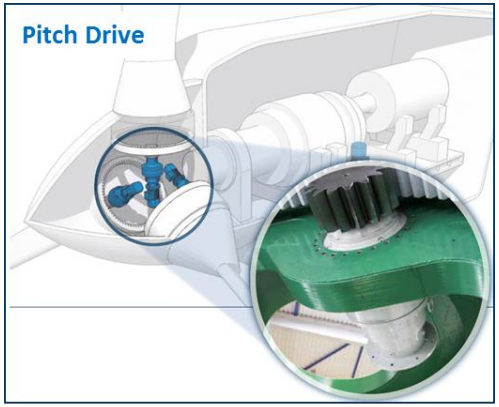
- Variation of torque
- unexpected significant load in the real time duty cycle
- Need to analyse the duty cycle (for new machine development or prototype)
- To schedule the maintenance
- The torque control is required by special certification.

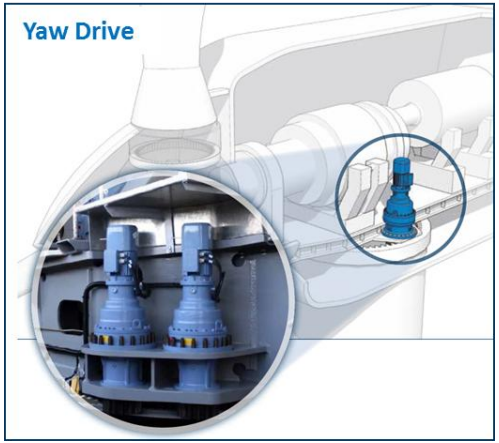
We are introducing new solution that is protectively integrated load cell into the system, in which the real-time torque data can be obtained from the system.


Pitch & Yaw Drive



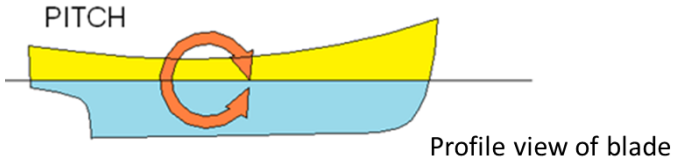
WHAT ARE WE GOING TO LEARN?
PITCH & YAW DRIVE



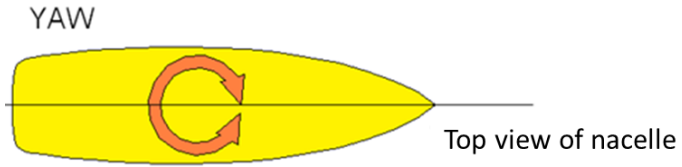


The pitch and yaw drive gearbox was selected as research object.

Pitch Drive
Pitch control gearboxes serve the essential purpose of setting wind turbine blades at the best angle to the wind to turn the rotor.

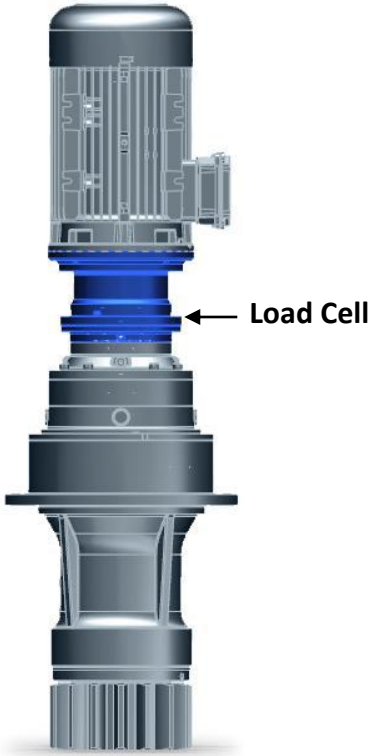


Yaw Drive
Yaw is the angle of rotation of the nacelle around its vertical axis. Efficient yaw control is essential to ensure that wind turbines always face directly into the wind.



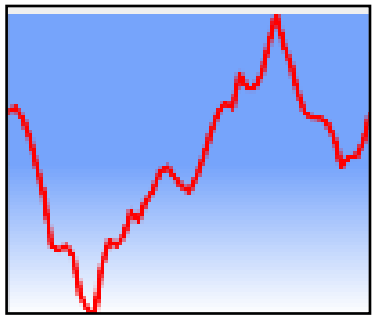
THE NEW SOLUTION
INTEGRATED LOAD CELL WITH GEAR BOX

Schematic view of new solution with gearbox



What can it do?

- Make the Shut Down of e-motor *if necessary*.
- Reduce the Input Power, e.g. by Frequency Converter.
- Elaborate the information by Customer PLC, e.g. creating Working Graphic in Real time



Key Features

- Load cell is integrated INSIDE the gearbox, with an external output cable to monitor gearbox performance.
- **Precise** and **quick** measure of torque
- Real time torque monitoring
- Automatic motor switching
- Anti-seize function

Technical Information

The Load Cell is located between the e-motor and first stage of transmission.

- It can be fixed with all IEC and gear stages just changing the interface component

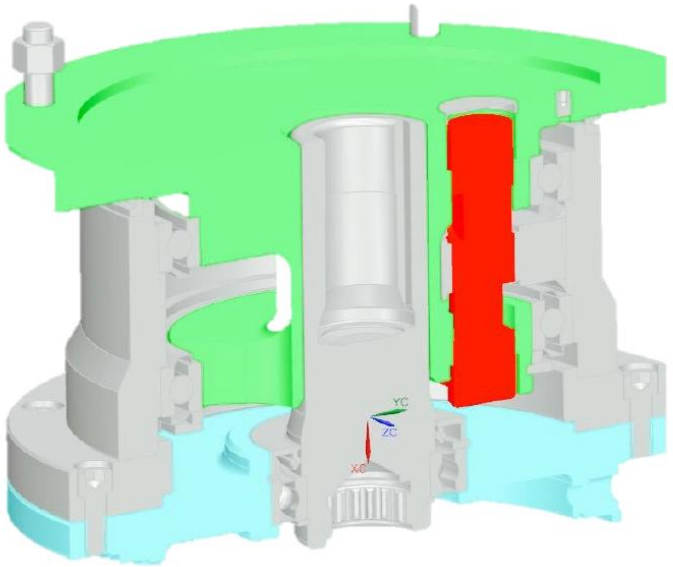
Application

Can Use in all applications with an e-motor where it is necessary to control and manage the input power, including.

- Yaw Drives
- Pitch Drives

Bonfiglioli Forever Forward

HOW IT WORKS?
INTEGRATED LOAD CELL



The New Patented Solution

- The Load Cell Transducer (**Red**) is the only component that interlock the e-motor side (**Green**) with the gear side (**Light Blue**).
- The bearings permits the rotation of (**Green**) component stressing the load cell that measures the load.
- When the transmission works the transducer absorbs the forces generated sending a proportional signal to the transmitter.

HOW IT WORKS
LOAD CELL TRANSDUCER

Technical Information

- Material: Stainless Steel
- The load cell positioned into its Housing measures the Tangential Force generated during the working phase sending the signal to the Transmitter that convert the signal to a Torque Value.
- The signal made is proportional with the force measured.

TRANSMITTER
SPECIFICATIONS

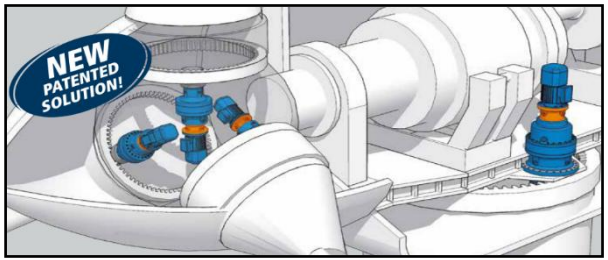
Technical Information

It converts the signal from load cell in torque value.

- **Configuration and Calibration can be done:**
  - By Panel
  - By PC via USB with Software supplied
- **The Transmitter can:**
  - Show directly to display the Torque Value
  - Make a Continuous Output signal:
    - Voltage: 0-5V, 0-10V
    - Current: 0-20mA, 4-20mA
  - Make a Pre-alarm Signal and Alarm Signal at a Torque value set

CONCLUSION AND ADVANTAGES

SUMMARY



Advantages of Integrated Load Cell:

- Real time torque measurement
- Turn-off of the e-motor *if necessary*
- Reduce the Input power during peak torque
- Real time information graphically for varying loads
- Estimate and Reduce service frequency.
- Compact solution.

A mechanically elegant, technically excellent and low maintenance solution in any environment deployed in the gear system is also easily and quickly replaceable insert, where it is necessary to use in all pitch and yaw drive applications. By this way the load cycle obtained,

- will help to design similar gearboxes for similar application with more precision.
- will gives way for constant product development.
- will monitor the gearbox behaviour.
- will reduce the operating cost.
- will reduce the maintenance cost and extend the product life.

Thank You