



## **Load Pins for critical load measurements.**

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6<sup>th</sup> May 2011

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### **Load Measuring Pins**

In the Oil industry we have examined the most frequent uses for the load measuring pin including drill rigs, supply boat to sub-sea assemblies.

The load pin can usually replace an existing joint where a clevis pin is used from cranes, winches, anchor chain stops to wedge socket and shackles.

The design of the pin examines the use of the material the pin is manufactured, this is usually a high strength stainless steel and sometimes a super alloy to the best method of protection of the strain gauges including use sub-sea.

Strain gauges are used to measure the shear strain at the maximum shear section through the pin and arranged into a whetstone bridge circuit. By using the shear stress the measurement is not dependant on load position and the supports as bending effects have very little effect on the measurement. To help with this 3D modelling is used that is then linked to a finite element analysis packaged. With the use of the FEA the stresses in the pin can be seen and allows for modifications to be carried out before material is cut. The 3D modelling also allows the product to be visualised before final drawings are completed.

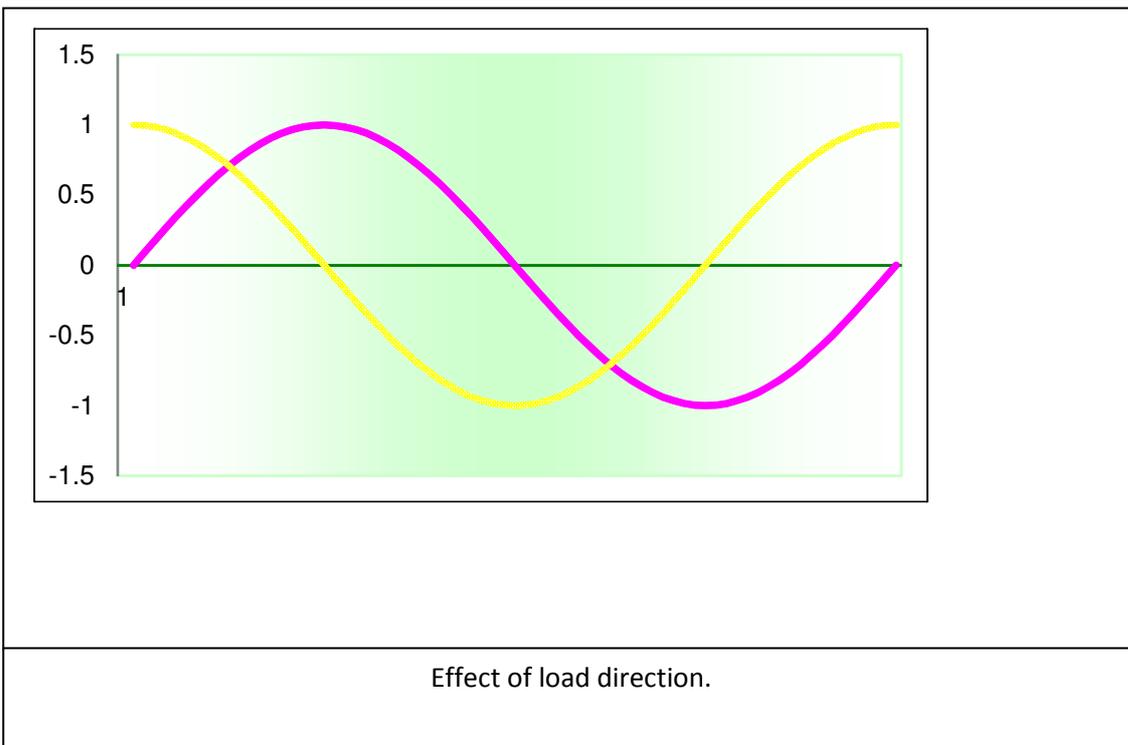
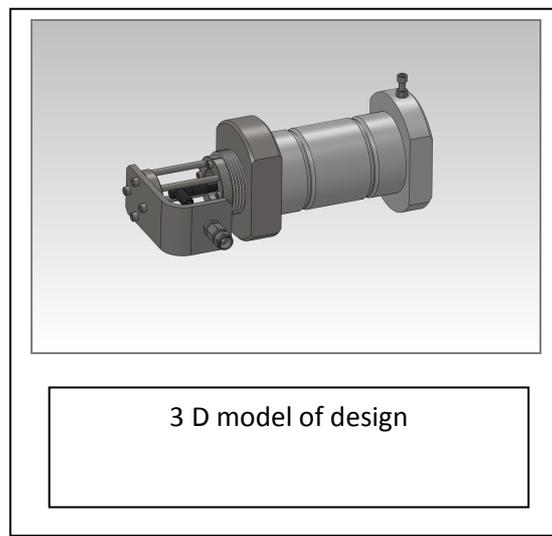
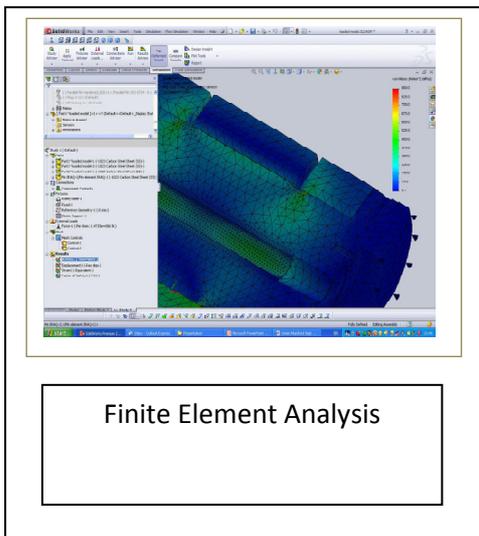
The load pin can also measure loads in more than one direction and so can measure the loads in two plains X and Y. The output from the strain bridge generally varies as the angle of the applied load rotate around the central axis by the cosine law and so with a single applied bridge at 90 degrees the output has reduced to zero.

The graph below shows the effect of the load being applied at varying angles around the pin. By installing a dual bridge offset by 90 degrees it is possible to have two signals from the pin, which can be used to determine the resultant force and angle.

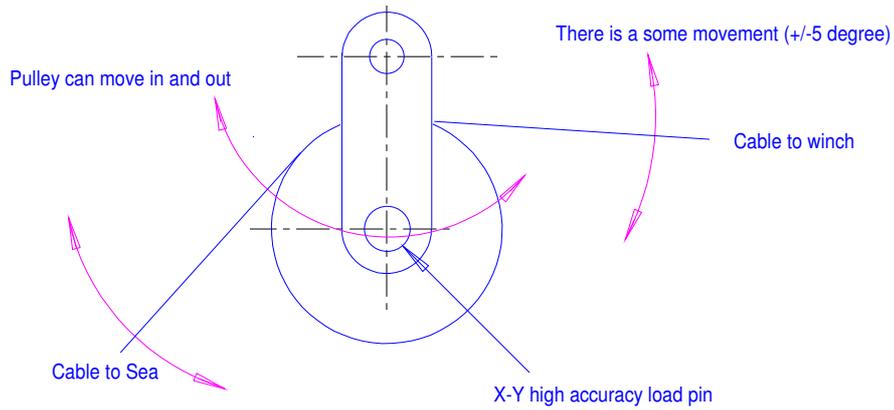
This format of pin can be used on variable angle jib cranes without adding extra steelwork to give a constant effective angle over the pin.

By having the loads in both plains the resultant load can be calculated and by referring one of the plains to a known angle the direction of load can be calculated.

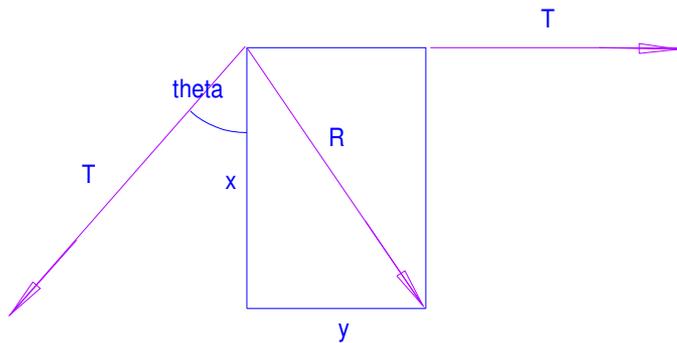
We also know that strain gauges can be classified as simple apparatus and so makes it easier to use in hazardous area with the use of the correct electronics.



## Typical Layout



And measure



The measurements required are for the  $T$  and the 'theta' angle

## Applications for load pins

With anchor handling using the winches load pins can be installed in the brake mechanism for static load measurement or in the base of the winch for dynamic measurements. There are so many variation with winch design and the requirements required from the operator each case is considered indevidally

Mooring buoys are another application that load pins are used to measure the hawser tension. This application is critical for safety as well as knowledge and a effort is being made to look at the predicted life of the hawser.

Chain stoppers for tanker, tugs include pins that can be monitored to control forces.

Diving equipement that needs load monitoring often use load pins as a practical way to monitor load.

Drill string tension and heave compenstion us load pins as method to capture the load.

## Future Developments

As knowledge of materials and as designs develop the load measuring pin is improving in accuracy and prodicted life is increased the associated electronics are making easier to measure loads that were difficult in the past but can now be continually monitored.





Winch load/anchor loads



Hawser line loads



Crane safety and drill string



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