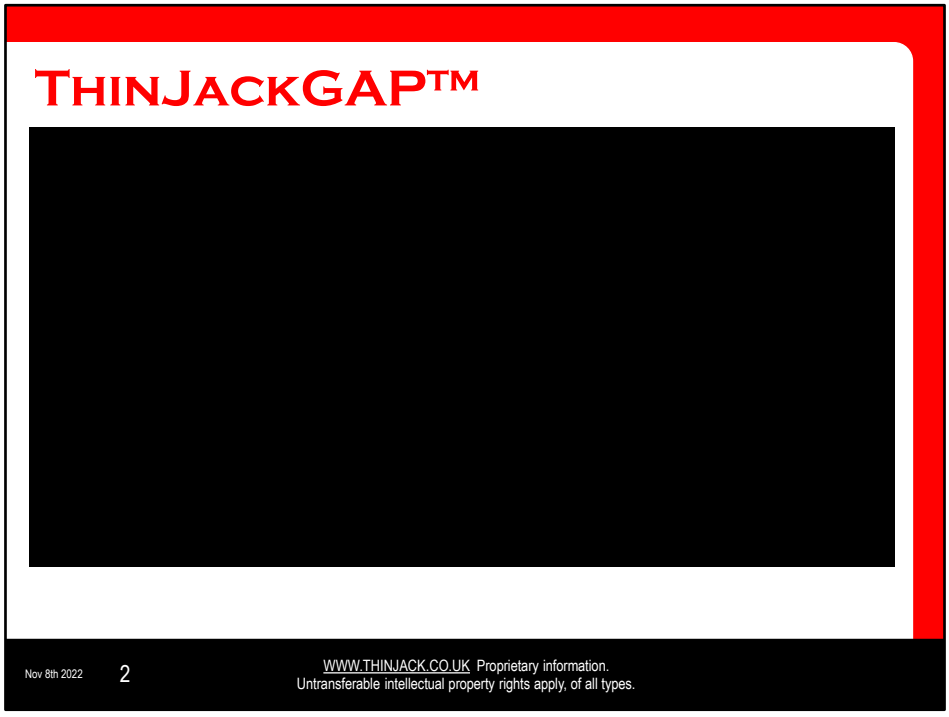
ThinJackGAP™

- Is used on well flanges which are stuck together.
- It's a system for measuring and displaying flange gaps, whilst separating them.
- The digital display allows manual adjustments to the flange gap so that it separates evenly, without jamming.
- It's intrinsically safe, to use on offshore platform wells.

- This system is developed from our experiences of on-site well flange separations since 2007, on 4 continents.
- Good afternoon: I'm Guy Bromby, from ThinJack Ltd, a services company in Westhill.



The video shows the gap measuring system used with a flange separation system.

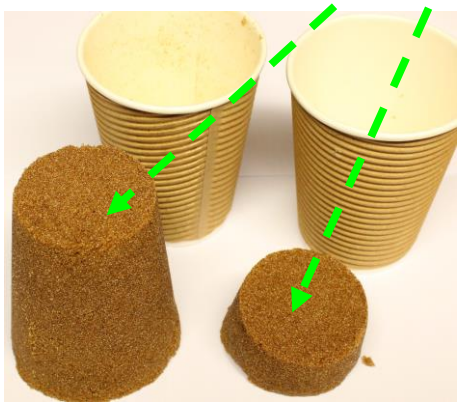
The context of bolted flange separation to install BOPs, well maintenance or brownfield tie ins:

- There are various forceful processes for separating seized well flanges, by pushing or pulling rusty bolt hole annuli from rusty studs. These include drill strings, cranes and ThinJack Ltd's own separation services.

- Invariably the rust around the flange circumference is uneven, which means that when the flange is forcefully separated: it tilts a little, as here, and then jams.

- Regrettably, human nature ignores that "silent nag" to stop. Instead applying even higher force and jamming the flange further.

CONTENT OF BOLT HOLE ANNULI



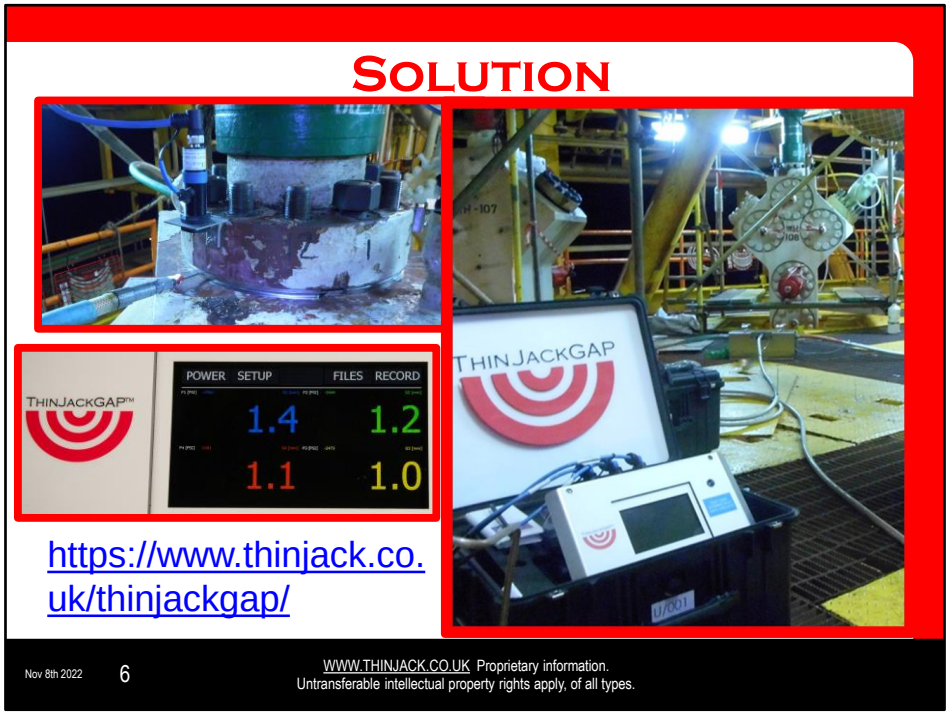
- These brown truncated cones represent the half litre volume of iron oxide rust which can build up in the bolt hole annuli of a 770 mm diameter bolted flange. This rust makes it challenging to separate the flange.
- Usually, one side of the flange is rustier than the other, for example where exposed to the weather.
- The uneven distribution of this rust creates an unequal separation gap, or tilting, followed by jamming.
- Add in a slightly tilted conductor OR a non vertical pull OR a 45 degree angled flange OR a side outlet valve
- Then the problem is worse!

MORE CONTEXT: I can't see this well with awkward access between pipes

Crowded pipework hides some well flanges.

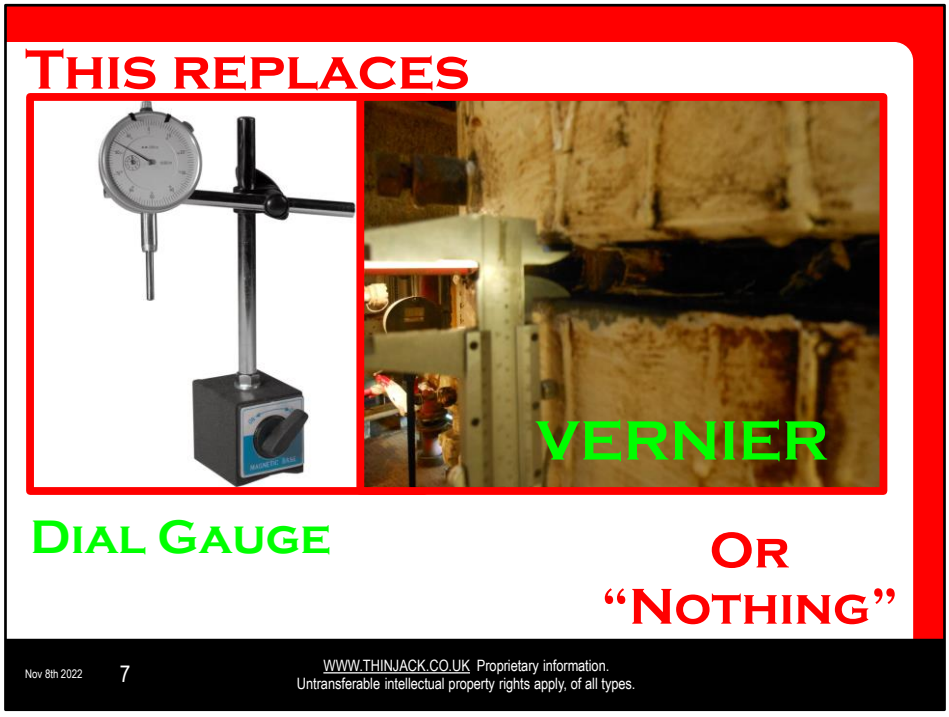
As the two flange parts are separated, there may be:

- no line of sight to them;
- constrained person access to measure, manually, the flange gap;
- hazards from standing next to a powerful push or pull.



- Upper Left: Gap sensors magnetically attached to flange around the circumference of the flange. An ultrasonic signal reflects off the block or a reflector plate, back to the sensor and measures a time.
- Right: The time is converted to a distance which is “offset” to display a gap.
- Bottom left: An increasing difference between the gaps shows the potential for an increasingly powerful flange jam. Pulling or pushing the flange must stop in order to set up an alternative method of separation, before hours are lost in unjamming the flange

The system is intrinsically safe.



- Dial gauges which appear an obvious solution. However, an intrinsically safe gap display, 5 to 10 metres from the gauge is challenging as a line of sight is unusual.
- Verniers do not give a real time display during separation.
- Most of the emergency calls which our company receives relate to uneven flange separation and then jammed studs or bolts inside the bolt holes.
- These are further stuck by applying even higher jamming forces in futile attempts to overcome the needlessly created impossible.

Why Game Changing ?

- Delays from a tilted and jammed flange may be 1 to 3 days. Avoiding this saves the daily rate, of a UKCS drilling crew & well platform rig, which is say £150 K +.

USED ON THESE WELL PLATFORMS

1. UK: Forties Delta. Well 4 - 2.

   Dec 2018. Apache North Sea.

2. Sarawak, Malaysia: Well E11-108.

   May 2017. Shell.

Thank you.