

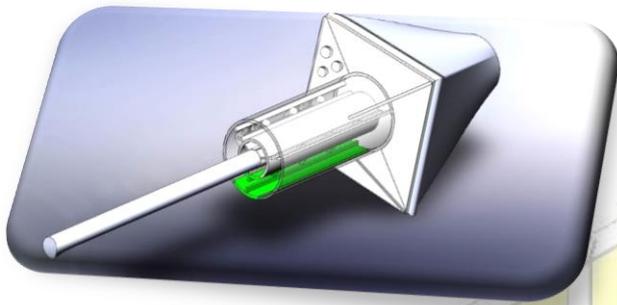


## Bespoke ROV Tooling.....The story behind the Subsea Bumble Bee

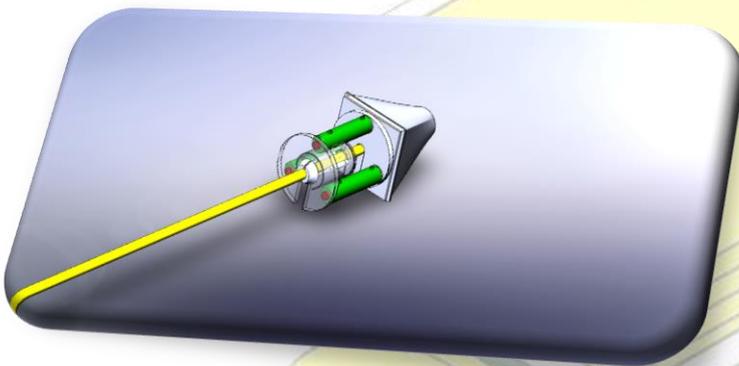
During the summer of 2015, Subsea Tooling Services was approached by a large and well known Aberdeen based ROV operator to design, build, and test a unique tool to assist them in one of their offshore work scopes.

Subsea Tooling Services was given a very tight time scale to engineer a proposal and then a solution to extract a stuck controls umbilical from a J tube riser and present this to our client.

The only real constraint from our client was that under no circumstances was the umbilical to be damaged as this was a newly laid main hydraulic / electrical controls umbilical for a satellite oil field in the North Sea.

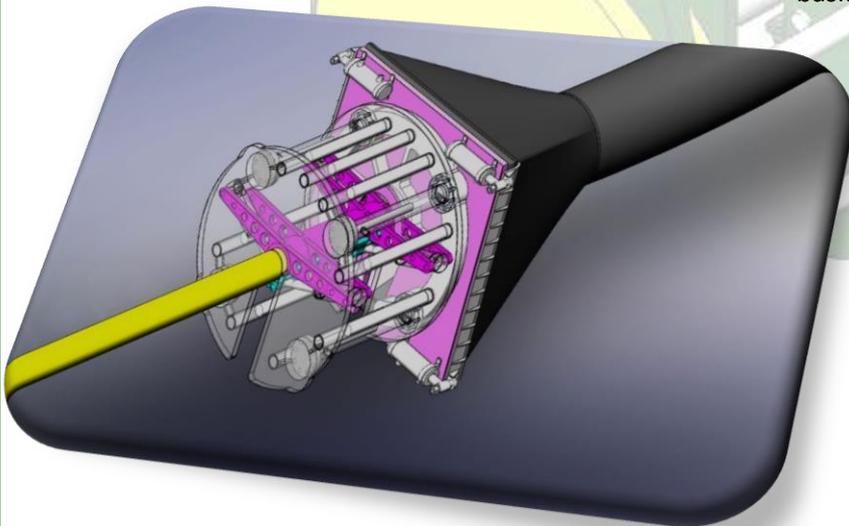


On being awarded the contract to supply the tool STS worked very closely with our chosen fabricator to ensure delivery of the proposed package was achieved.

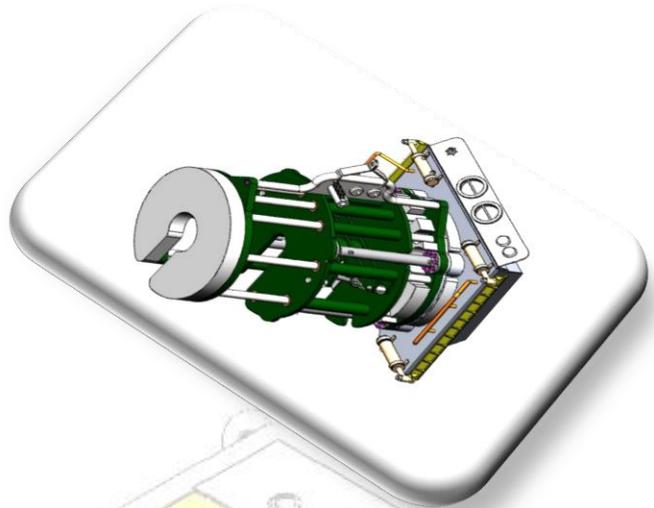
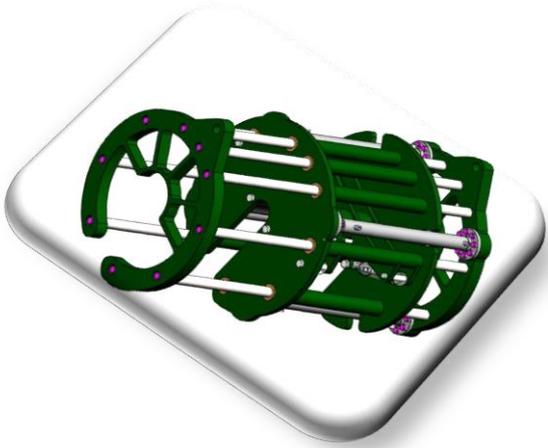


The design went through several stages of evolution before we were satisfied our concept would stand up to the rigorous forces required to pull out the umbilical.

Using our years of experience with ROV tooling STS came up with a tool that could be deployed subsea in one of our subsea baskets and picked up by the work class ROV and deployed to the worksite.



As the tool had to be flown over 200m to the worksite from the point of deployment we had to design the tool with enough buoyancy so that the ROV could still fly whilst carrying the tool. Various calculations / simulations were carried out on the model until we were certain we met our client's parameters in both overall weight and functionality.

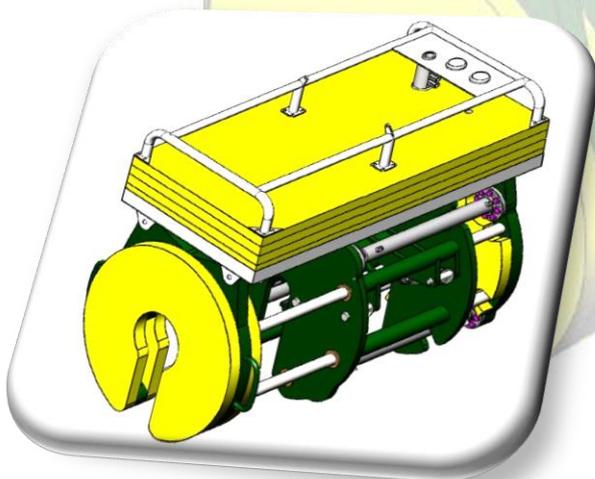


During the design process it became clear that we needed to split the tool into two separate halves. The size of the tool was becoming too large for one ROV to handle, so in turn the FRP & URT were born (Flying Reaction Plate) & (Umbilical Removal Tool)

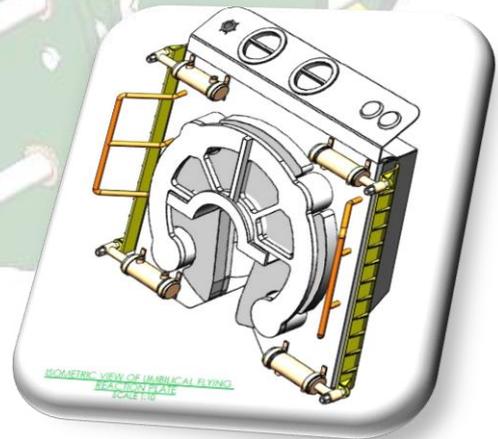
The FRP would be the first part of the tool that would be deployed to the J tube bell mouth and would be hydraulically locked to the bell mouth by 2 locking clamps that would be actuated by the ROV via a 4 port hot stab. To ensure the FRP would remain locked to the bell mouth whilst the ROV went to get the 2<sup>nd</sup> part of the tool, ROV valves and dual check valves were designed into the FRP's hydraulic circuit.

Once the FRP was locked to the J tube bell mouth the ROV would re-locate to the work basket and remove the URT and fly this 200m to the J tube bell mouth at the base of the platform.

Using 2 work class ROV's the URT was gently lowered down onto the hang off shoulder on the FRP. From this point the umbilical extraction could begin.



Umbilical Removal Tool (URT)



Flying Reaction Plate (FRP)

## The Building and testing of the Subsea Bumble Bee



Subsea Tooling Services chief design engineer Cameron Anderson worked very closely with the fabricators during the building and assembly of the tool and was present throughout all stages of the final assembly leading up to initial testing.

Daily meetings with our client were carried out to ensure we were on track to deliver the completed tool in the very tight schedule we had.



On completion of assembly the URT & FRP were taken to Aberdeen University's test tank facility to undergo stability testing to see how balanced the tools were in water, and to ensure they were within the parameters set by our client in regards to weight.



To simulate the operation subsea, a mock bell mouth was fabricated to check the tool would lock on and be able to pick up the umbilical and extract it at the forces expected.

Subsea Tooling Services operated the complete tool through a proportional valve pack that was controlled via a laptop computer.

The complete tool assembly was controlled through 1 x 4 port male hot stab that was shared between the FRP & URT.



Using mock pieces of test umbilical STS performed a total of 6 different trials witnessed by both our client and the oil field operator.

From these trials the Subsea Tooling Services tool was deemed the most likely to succeed in extracting the stuck umbilical.

On completion of all testing the URT & FRP were completely stripped down and all components were sent off to be xylan coated to protect the aluminium frame from corrosion.

This new appearance combined with the yellow buoyancy led the tool to being nicknamed the *Subsea Bumble Bee*



To deploy the tool to the seabed one of Subsea Tooling Services subsea baskets were modified with special mounting brackets so that the tools could be hydraulically locked into the basket on deck and safely deployed to the seabed without risk of losing the tool during the descent.



At our clients request 2 x Subsea Tooling Services engineers were provided to operate the umbilical removal tool offshore.

Who better to operate the tool offshore than the men who had originally come up with the concept, designed, assembled & tested the tool...

Well did it work???

All at Subsea Tooling Services and our fabricators ESRUK are proud to say that we designed and built the world's very first umbilical removal tool that successfully removed a stuck umbilical from a J tube on the 15<sup>th</sup> of September 2015 with a force of approx. 10 Tonnes

