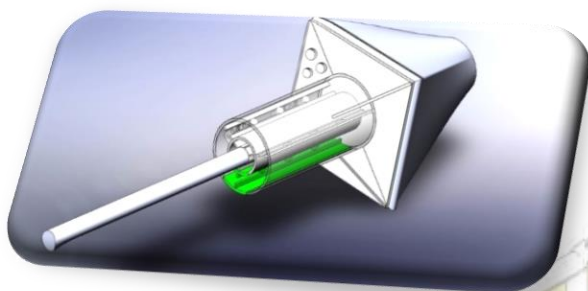


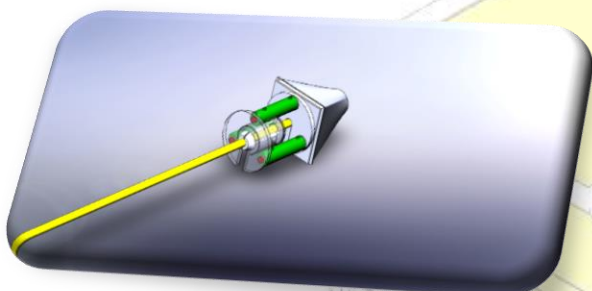


## Bespoke ROV Tooling.....The story behind the Subsea Bumble Bee

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.



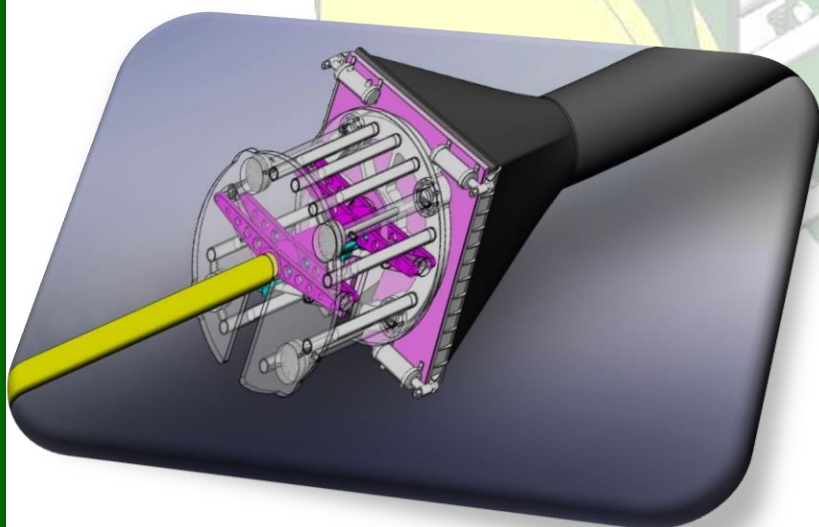
The only real constraint from our client was that under no circumstances was the umbilical to be damaged as this was a newly laid main hydraulic / electrical controls umbilical for a satellite oil field in the North Sea.



On being awarded the contract to supply the tool STS worked very closely with our chosen suppliers 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, 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.

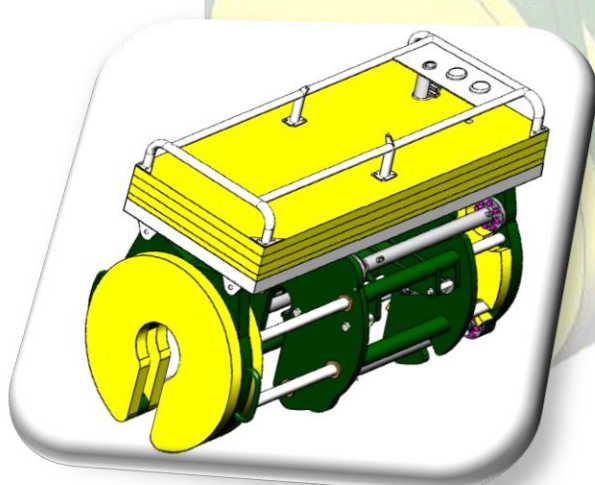


During the design process it became clear that we needed to split the tool into two separate halves. The size of the tool was becoming too large for one ROV to handle, so in turn the FRP & URT were born (Flying Reaction Plate) & (Umbilical Removal Tool)

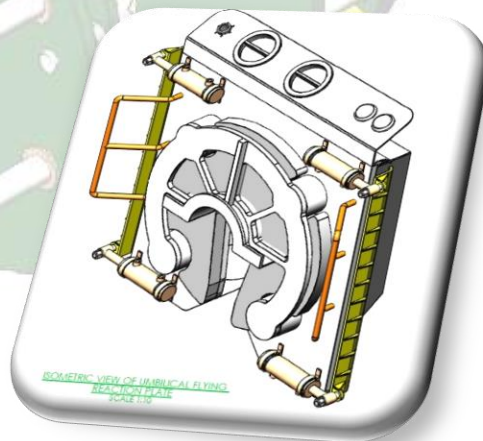
The FRP would be the first part of the tool that would be deployed to the J tube bell mouth and would be hydraulically locked to the bell mouth by 2 locking clamps that would be actuated by the ROV via a 4 port hot stab. To ensure the FRP would remain locked to the bell mouth whilst the ROV deployed 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 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.



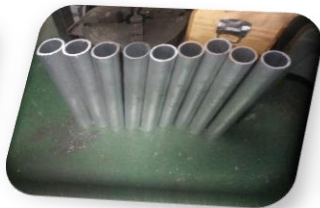
Umbilical Removal Tool  
(URT)



Flying Reaction Plate  
(FRP)



## The Building and testing of the Subsea Bumble Bee



Subsea Tooling Services chief design engineer Cameron Anderson oversaw the work of our technicians during the fabrication and assembly of component parts of the tool including the final assembly and initial testing.

Daily meetings with our client were carried out to ensure the planned schedule was on track to deliver the completed tool fully tested on time.



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 was 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 or damaging the tools during deployment.



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 personnel who had originally come up with the concept, designed, assembled & tested the tool....

Well did it work?

All at Subsea Tooling Services 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



## Bespoke ROV Tooling..... *The Subsea Bumble Bee returns in 2016*

Due to the success of the 2015 umbilical extraction, Subsea Tooling Services were again contacted by a major Aberdeen based ROV operator in November 2016.

The work scope involved the change out of an existing subsea umbilical which had started to break down in integrity after 25 years of service.

Due to the length of time the umbilical had been in situation, it was feared by our client and the oil field operator that conventional methods of extraction may not work due to the build-up of marine growth around the bell mouth and within the J tube riser.

Recent surveys done on the J tube bell mouth revealed it was almost completely buried in silt.



Subsea Tooling Services were chosen as the main subsea contractor to provide the tooling required to extract the controls umbilical from the J tube, this also included the STS 12" & 8" Dredging systems

The STS 30 Ton subsea winch was chosen as the primary method of extraction and the Subsea Bumble Bee was chosen as the contingency in the event the umbilical proved to be stuck in the J tube.

As this J tube bell mouth was of a different design to the square type interfaced with back in 2015, STS re-designed and manufactured a new circular type of FRP (Flying Reaction Plate) to engage with the platform's J tube riser bell mouth.





As with the 2015 campaign the client wanted a complete FAT test carried out, so a mock bell mouth was fabricated based on original drawings provided by our client.

The mock bell mouth was interfaced with Subsea Tooling Services Test Bed Reaction Kit (TBRK) which was originally made for the 2015 campaign but re-engineered for the latest type of bell mouth.



Above picture shows the URT during FAT testing interfaced to the new design of FRP which was pre-installed on the mock bell mouth and secured by 4 x locking dogs.

As this scope was to be completed by divers instead of ROV, a roller box was added to the rear end of the URT to aid divers in the extraction of the controls umbilical.



All the re-engineering was completed in a very tight time scale to meet a short notice mobilisation.

Subsea Tooling Services technicians were once again requested to go offshore to operate & maintain a large fleet of tooling, and we are pleased to say the work scope was completed to our clients satisfaction.

