Since our last newsletter, STAR (Specialised Training in Aviation Fuels and Refuelling) has been incredibly busy in Australia, New Zealand and the South Pacific.

Yes, our reach has expanded significantly, and STAR have enhanced our team selectively to cope.

Previously, we told you about Rod Baker and his substantial ship-to-shore training experience. Since engaging Rod to meet the needs of a specific client, we have had many other organisations contact us for training to discharge complex ships.

This really is a win-win story for all with an increasing pool of very happy clients maintaining or improving their competence in this critical task. We have been able to broaden the services we offer as this area is one that really does require significant expertise.

Angelina Badri has also joined us as an expert in Safety Management Systems and Risk Management.

Angelina is highly experienced in the oil and mining industries and provides a practical approach to the development of Safety and Risk Management Systems.

Bringing Angelina on board increases our capacity to provide our clients with the specialised resources they need when they need them.

STAR is now in the unique position of having a network of experts in Safety, Aviation Operations, Ship-to-Shore operations and terminals and engineering services. We also provide Trainer Development in all the forementioned Safety and Operational areas, with a desire and capacity to build competence and support within the industry.

We listen to our clients and work with them to deliver a sustainable and cost-effective solution. While we do not want to be a permanent fixture in our clients' businesses, STAR can be there to support you and bring the right resources to bear when they are needed.

Produced by STAR Specialised Training in Aviation Fuels and Refuelling
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C & L SERVICES COME TO THE RESCUE IN SYDNEY

STAR has just completed working with a major client starting an aviation fuel supply operation in Australia. This has been one of the more complex projects bringing together the Product Quality, Engineering, Design, Hazop and operations resources within our business to help the terminal operator and the supplier develop a low-cost and robust process for the import, storage and distribution of high-quality Jet and Avgas to market.

We had experts on hand in case support was needed for the first cargo because you can never be too complacent when dealing with Aviation fuels.

I'm thrilled to say that the first cargo was received without a hitch, with the support of ***C&L Services*** who were able to secure testing equipment at short notice and will perform the site Millipore tests.

STAR only deals with three aviation asset maintenance and spare parts providers because we know their high standard and capabilities, and we are confident that they share the same philosophies as we do - which is to provide quality at realistic price and full support for the services and products they provide.

- C&L Services – based at Sydney Airport.
- Aviation Components - based in Brisbane.
- Aviation Refuelling Maintenance – based in Adelaide.

AVIATION FILTER UPDATE

Airlines For America (A4A) have just released their latest update for the developing filtration technology changes. You would remember from prior articles on this subject that Filter Monitor elements were considered failsafe filtration because they blocked in the presence of water and particulates. Unfortunately, at some locations around the world, the knowledge of refuelling operators, operations staff and maintenance staff was below par resulting in some filters being operated beyond their limits. The most significant case and the one that started the changes we are now faced with was that involving CX780 in 2010 where some of the Super Absorbent Polymer media within the filter elements was allowed to pass through to the aircraft causing fuel control issues that caused the crew to believe that they may have to ditch in the South China Sea.

Since then, Faudi have developed a combination Dirt Defence Filter (DDF) to remove particulates from fuel and an Electronic Water Sensor (EWS) installed in pipework downstream of the DDF to monitor the fuel for free water. This replaces the current Filter Monitors and removes the presence of SAP in the fuel stream to eliminate the opportunity for SAP-migration into the aircraft fuel tanks. The EWS will respond to detected free and suspended water by shutting down the refuelling equipment until the cause of the water is determined and removed before it can be restarted.

The Energy Institute has now accepted Facet's Water Barrier filters (in the 2-inch candle elements only at present) as another alternative to the Filter Monitors. Interestingly, the 6-inch VF61 monitor elements have never been qualified by JIG but they are constructed to the same standards and performance criteria as the

2-inch candle models and are used throughout the world for fixed dispenser filters. Facet produce an equivalent water barrier element for the VF61 vessels. While it's not qualified by EI, JIG or A4A, like the monitor elements, it is made to the same standard and performance criteria as the 2-inch version.

This is a drop-in replacement without the need for asset modifications and will capture particulates and repel water on the upstream side of the element. Both the repelled water and particulates will result in an increasing differential pressure. The water can be drained from the filter vessel sump reducing the differential pressure. The particulates will reside within the filter until replaced.

Both have advantages and disadvantages when compared to each other and the current filter monitor elements. Both are more expensive than the current filter monitors.

The current filter monitor elements will no longer be qualified for use from July 2023. Sites operating to JIG or ATA103 will need to select one of the new technologies to be compliant.

STAR has no affiliation with any of the suppliers, so we remain unbiased in our assessments and advice.

Performance	Filter Monitor	Faudi DDF/EWS	Parker Water Barrier
Presence of SAP in the fuel supply	Yes	No	No
Traps water	Yes	No but will shut down refuelling system	Yes
Drop-in replacement	Yes	No requires asset modifications and power supply for EWS	Yes
Requires annual change	Yes	No	Yes
Requires recalibration	No	Yes, 2-yearly at Faudi in Germany	No
Lifespan	Annual unless differential Pressure indicates changeout required earlier	Unlimited subject to satisfactory recalibration	Annual unless differential Pressure indicates changeout required earlier and indications are that particulate capture will result in more frequent changeout in high volume applications
What to do when dP at limits	Change elements	Refuelling shuts down automatically until "wet" fuel is removed from fuel supply system before able to restart refuelling	Drain filter sump, restart refuelling
Cost		Expensive to install and the 2-yearly calibration is expensive	More expensive than Filter Monitors and we are trying to get pricing information currently.

Our current thoughts are that the water barrier technology is more suitable for the regional and smaller throughput volume sites and those where a power supply to an EWS would be problematic from the perspective of installation cost, ongoing maintenance cost, lifespan and ease of operation.

We will have more for you in April.

Ship-to-Shore operations

Many people struggle with the concept of weighted-average density calculations, but it is actually quite a simple concept.

Take, for example two different batches of fuel. Each 1 million litres. The first has a density of 0.7800 and the second has a density of 0.8000.

Mixing them together, you would expect the resultant density to be 0.7900 because, when the volumes are equal, the density should be right in the middle of the two individual densities.

It is no more complex to calculate the density of a tank after a receipt. It is simply the mixed density of the volume in the tank before receipt with the volume being received.

When the volumes are not the same, it is just as easy, but the volumes become part of the calculation now.

For example, we have 453,230 litres of Diesel with a density of 0.8250 in the tank before a receipt. We are about to receive a parcel of 4,625,670 litres of diesel with a density of 0.8435.

We need to perform an expected weighted average density before receipt against which we will measure the actual density.

$$\frac{(435{,}230 \times 0.8250) + (4{,}625{,}670 \times 0.8425)}{(435{,}230 + 4{,}625{,}670)}$$

$$= \frac{359{,}064.75 + 3{,}897{,}126.975}{5{,}060{,}900}$$

= 0.840995 (rounded to 4 decimals 0.8410)

After the receipt, we should be able to sample the tank and see that the density is within 0.0030 of the expected density.

If it's not, there are a few possible reasons, but first we need to stop to investigate and determine the reason.

We could have made a **mistake in the calculation** (do it again to check); the tank is layered with different layers having different densities (draw samples from different depths and test the densities); or the product has been contaminated during the transfer with another batch of the same product with a different density or a different product.

A layered tank is OK providing we can reconcile the densities at the different layers – normally at 1m intervals to determine the volumes and densities in each layer so we can release each layer of the tank on a different Release Note.

For **product cross-contamination**, the product must be isolated and specialist Product Quality advice sought to determine whether the product is saleable or will have to be removed and sent back to a refinery for re-processing.