THE Armbrust AVIATION GROUP Jet Fuel Report

Volume XX ✈ Issue 5/6 Autumn/Fall 2014

HIGHLIGHTS

From the Desk of Keith Carter, International Director…

The IATA Fuel Forum Meets in Dubai

The IATA Fuel Forum convened in Dubai this week, returning to a city which last hosted the event back in late 1999.

Much has changed since then, both for the city and our industry. The Marriott Forum hotel had not been built back in 2009 - it was just desert - and the airport was just a minnow compared to today.

As for the airline industry, we were facing the millennium fears (which did not emerge), 9-11 and SARS had yet to happen, and the impact of the LCCs was in its infancy.

Plus, closer to home for Forum delegates, oil and jet fuel prices were at levels airline fuel buyers (but maybe not suppliers!) can only dream about today.

However, despite all these changes and events, many of the personnel who came to Dubai in 1999 are still around - myself included! It's testimony to the fact that despite all of the developments - commercially and technically - aviation jet fuel remains at its heart a people business.

So once again more than 600 people have seen value in getting together in Dubai to conduct business, network and keep abreast of all that's new in our industry.

This issue of JFR focusses on some of the latest developments and updates, with particularly valuable contributions from Mike Farmery, who has been instrumental over the years in bringing Commercial and Technical closer together. He thoroughly deserves his Armbrust Award as Fuel Person of the Year (see below).

The Armbrust Group will continue to comment and support the industry as it moves forward, through its Daily Briefings and Jet Fuel Reports. (If you don't get these, please contact me!)

Finally, AAG would like to congratulate again all the Award winners who were announced earlier this year and/or more recently, and who received their Certificates here in Dubai.

JFR

Remaining 2014 Armbrust Awards Announced

When the results of the Annual Armbrust Survey were announced earlier this year a number of categories were held back to allow more time for submissions.

This year's exercise has now been completed and AAG is delighted to congratulate the following winners:

Best Operational/Technical Performance

Shell Aviation picked up this Award to complement their win as the Best International Marketer.

Best Contribution to Alternative Fuels

SkyNRG won this category, repeating their success of last year.

Fuel Person of the Year

In recognition of all his great work over many years with Shell Aviation, and now an independent consultant, **Mike Farmery** is a worthy winner of this Award.

JFR

Looking back it has been an exciting and rewarding journey, both professionally and personally. It has far exceeded my expectations.

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For more information on AAG or its publication visit

www.armbrustaviation.com

Company news …

Changes at the Top in Shell Aviation

After three years leading Shell Aviation, Xinsheng (Sheng) Zhang is moving on. His successor is Anne Anderson, who joins Aviation from Shell's Trading and Supply business in the USA.

Sheng has presided over a successful period at the company, most recently winning both the "Best International Supplier/Marketer" and "Best Operational/Technical" Awards in this year's annual Armbrust Survey. Sheng has handed over a solid business and Anne is well qualified to continue in his footsteps.

JFR caught up with Sheng in his London office to get an exclusive interview shortly before his move was announced, asking him to look back over his three year's tenure in charge of Aviation. Anne has also granted JFR an introductory interview in her second month on the job.

JFR: What is your over-riding impression of the past three years?
XZ: Looking back it has been an exciting and rewarding journey, both professionally and personally. Working in a truly global industry with such unique opportunities and challenges has far exceeded my expectations.
JFR: What have been your key priorities?
XZ: The number one priority for Shell Aviation is, and always has been, safety. It's paramount for our customers to have 100% security of both supply and operational/technical excellence. I am delighted that this has been recognized by the industry with our Armbrust Award in this category, in addition to being voted by our customers as the best international supplier/marketer. Furthermore, it is great to see our former Shell Aviation employee Mike Farmery being rewarded for all the work he has done in this area over many years with winning the "Fuel Person of the Year" award.
JFR: Can you expand on this please?
XZ: Firstly, it's a long way from the refinery to wing-tip, so a robust and complete supply management is essential. Right from the start I have been very impressed by the quality of the Shell systems.

Xisheng (Sheng) Zhang

At the airport there are many challenges due to the complexity, congestion and sheer numbers of people involved in turning aircraft around safely and efficiently. The Shell Aviation Fuel Quality Assurance System includes fuel sampling and laboratory analysis at key stages of the supply chain.

We also conduct more than 400 safety audits every year at airport facilities across the world. As part of the drive for safety excellence, we have started the Process Safety and Asset Integrity review at our airport operations. From the receipt of incoming fuel, to safe into-plane delivery, every stage is accounted through our stringent refuelling procedures.

You can't achieve all this alone and I'm pleased to say that our regular "Safety Days" have been effective in establishing a stronger safety culture across our operations and have become comprehensive events with both customers and non-customers attending. At Royal Dutch Shell and Shell Aviation we have a 'Goal Zero' policy, which means 'No

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Shell has been a leading player in the development of alternative fuels for aviation, but the challenge remains to make these products more competitive.

Harm to people and No Leaks to the environment'. This objective underlies the strong safety culture established within Shell Aviation.

JFR: Clearly, safety and security is paramount, but what else does Shell Aviation offer?

XZ: Serving customers is at the centre of everything we do. Of course we have to be competitive, but also add incremental value for our customers. We link customer needs with a strong focus on innovation and technology to enable us to create services and products that make a real difference to our customers. I would highlight a number of examples of this:

We install and secure capacity to match market needs and growth aspirations. For customers, this means security of supply and assurance of superior high quality products. For fuels, we have a current network of 17 Shell refineries around the world. This gives us reliable production of high quality fuel. We can also secure fuels from the merchant marketplace via our trading network. Our extensive network allows us to serve customers in key locations where they need us.

We have professional, dedicated teams across the globe, trained to deliver safe and efficient refuelling. We not only ensure high safety and operational standards where we operate, we are also actively involved in industry bodies which set them, including the Joint Inspection Group (JIG) Fuel Quality Committee, International Air Transport Association (IATA) Technical Fuel Group and the Energy Institute.

Shell is active across the full value chain. We have deep experience and expertise in areas from product development in the laboratory to refining, shipping, pipelines, trucking, storage and handling, and fuelling aircraft.

JFR: Yes, but what about your business?

XZ: It's essential to run a strong business, both internally and externally. I believe the Armbrust Award is a clear demonstration of the strides we have made in service, whilst becoming more efficient internally.

We cannot rest on our laurels, and there is always much to be done and areas where we can get better.

But we cannot rest on our laurels, and there is always much to be done and areas where we can get better. Looking back over the past few years I feel very comfortable that we have made the right decisions on resources and priorities.

JFR: So what is next for Shell Aviation? Where should your successor, Anne, be focusing her priorities?

XZ: I would highlight three areas:

- We need to continue to service our customer needs and keep supporting them to be competitive in this challenging market.
- We must maintain our focus on safety and technology to drive our business forward.
- Internally, we have to keep pressure on our processes and costs to ensure we remain competitive in the supply chain.

JFR: As you leave Aviation for pastures new, what do you see as the key issues facing the industry?

XZ: Firstly, how can we operate more efficiently? The industry has an impressive track record, but there is always room for improvement. And then there is the key issue of managing our environmental footprint. Shell has been a leading player in the development of alternative fuels for aviation and we have been researching biofuels as another source of alternative jet fuel. However the challenge remains in moving the most promising options from the laboratory to widespread commercial development and make these products more competitive compared to existing options.

One of the examples of Shell Aviation's innovation is a synthetic liquid jet fuel processed from natural gas – known as 'gas-to-liquid' (GTL). GTL Jet Fuel is certified as a blend of up to 50% of the synthetic GTL Kerosene and conventional oil-based kerosene. This is a clear example of how we can move forward with both lower particulate emissions and higher energy content.

JFR: On behalf of all in the Armbrust Group, and the wider industry, we would like to thank and congratulate you for all your work over the past three years, and wish you every success in your new role. In closing, do you have a "handover message" for your successor, Anne?

XZ: I am grateful to have worked with such passionate and talented people in the last few years. I would like to wish Anne success and add that this is a wonderful industry to be involved in.

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I believe that my past experiences, especially in Trading and Supply, are valuable in helping me to understand the aviation jet fuel supply chain and how to manage its complexities safely and effectively.

Shell Aviation is trusted and respected across the world and maintaining this strong reputation will be only possible through talented people and an unwavering focus on the key pillars of our business.

Welcome to the New Chief, Anne Anderson

JFR: Could you give us a few details about who you are and what you have done prior to this role?
AA: I started my career as a chemical engineer in manufacturing and technology at Monsanto. After receiving my MBA, I moved from the technical community at Monsanto/ Solutia through business development and marketing roles to become a Global Marketing Manager.

In 2003, I became the Segment Leader for Honeywell's Global Advanced Fibers and Composites business. I joined Shell Chemicals in the United States in 2006 as the General Manager of PDO (Propanediol) & CorterraTM Polymers and Board Member for the Shell Chemicals Joint Venture: PTT (Polytrimethylene terephthalate) PolyCanada in Montreal, Quebec.

Since 2009, I have held roles in Shell's Trading and Supply organization. Most recently, I was the General Manager of Trading and Supply for Shell Oil Products U.S. I will be based in London starting in January and am in the process of moving with my family from Houston.
JFR: What do you think you bring from your previous experiences to aviation?
AA: Reliable supply of high quality products from our refineries, trading businesses and distribution assets around the world is a crucial consideration for our customers.

I believe that my past experiences, especially in Trading and Supply, are valuable in helping me to understand the aviation jet fuel supply chain and how to manage its complexities safely and effectively.
JFR: What are your initial impressions?
AA: It has been fascinating so far. I am impressed with aviation's vast infrastructure, dynamic market challenges, and its substantial contribution to the social and economic fibre of our global economy whether measured in trade, tourism, or in medical support. It is a truly global business where we are active across the full value chain. Shell Aviation is in a strong position with excellent people, an extensive fueling network and the right structures in place, continuously working to improve its offer to customers.

Anne Anderson

JFR: What are your immediate priorities?
AA: I would like to learn more about the industry and get to know our customers and key stakeholders. Shell Aviation favours a collaborative style of working and I place great importance on establishing strong ties with customers and industry associations alike.

We have to be genuinely close to the customer and offer the right products and services in the right places. Having a deep understanding of their businesses, the challenges they face and the environments they operate in is very important for us to be able to effectively support them.

Shell Aviation is trusted and respected across the world and maintaining this strong reputation will be only possible through talented people and an unwavering focus on the key pillars of our business; safety, technology and operational excellence.
JFR: Thank you. We wish you every success.

JFR

Editorial note : I was delighted to meet Anne at the IATA Fuel Forum in Dubai, where she had the opportunity to meet up with many people in our great industry. KC.

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Shell Aviation

*Shell Aviation is named the 'Best International Jet Fuel Supplier' in the 2013/2014 Armbrust Awards based on votes received from airlines and fuel suppliers.

Why would an operator invest in automation at a terminal and replace a functioning system?

Varec … What Was New in 2104?

An Interview with Derek Blagg, Director of Commercial Programmes & Services

JFR: It has been a year since you re-introduced yourselves to the Armbrust Jet Fuel Audience, what has Varec been focusing on in 2014?

DB: During the past 12 months we have been working with a number of service providers, U.S. airlines and international airport authorities to identify how they can improve their fuels management operations. Based on our experience we feel the industry is starting to embrace the technology available in the marketplace to optimize fuel operations and improve upon the manual, paper-driven process.

We are also engaging a number of customers that have an interest in updating tank farm automation control systems to further improve operational efficiency and reduce risk.

JFR: Why would an operator invest in automation at a terminal and replace a functioning system?

DB: Many of the control systems we see are over a decade old or maybe twice that. It is an opportunity for us is to help identify the benefits fuels automation can bring to all involved, whether an airline, service provider or tank farm operator. Today there are increased concerns about safety and environmental accountability. Many of the older systems cannot meet today's standards.

Our solutions in the tank farm not only provide accurate inventory measurement and management, but also reduce the risk of a hazardous event occurring, such as a tank overfill or leak that would cause hazardous materials (Jet Fuel, Avgas or Diesel) finding their way into the local environment. We are actively involved in the development of the new API2350 standard for overfill

A key focus going into 2015, and something we are working with multiple vendors is taking what we do and delivering the next generation of fuel automation for apron fuel services.

protection systems. Some overfills are small and easily contained but the accumulation of product from repeated overfills or a single large spill can cause significant soil and ground water contamination and may eventually lead to a more catastrophic event such as a terminal fire. In the U.S. a small spill could cost an airport authority, service provider or tank farm operator millions in clean-up costs and fines. For a fraction of this price, a new tank farm control system could ensure safety and reduce liability.

JFR: Have you modified (or added to) your range of refueling solutions at all?

DB: For the Ramp and apron applications we have been testing new functionality to address over fueling aircraft, fuel tracking for GSE vehicles and the management and use of Glycol. Ground support agents can now use the same type of hardware that is used to record fuel delivery at the wingtip for these operations. Thus extending the capability of our customers to manage and view all fuel and service related transactions from one enterprise suite of solutions.

A key focus going into 2015, and something we are working with multiple vendors is taking what we do and delivering the next generation of fuel automation for apron fuel services.

JFR

Airport profile…

Fuel Supply at Dubai International Airport

Very few airports have seen growth like in Dubai International Airport. The fuel demand has been growing for years at rates greater than 10% per annum at the back of Emirates' robust expansion program. The airport demand in 2014 may be well over 1.8 Billion USG making it one the largest airports by fuel volume. The Airport is gearing to accommodate growth to beyond 100 Million passengers by 2020. There is a point in time, when the expansion cannot be accommodated on the existing footprint of the Airport that is itself not expandable. The answer for this is Al Maktoum Airport in Dubai World Central (DWC)

Five oil companies supply fuel at the Airport and also have the obligations to supply/maintain sufficient stock of aviation fuel, operate the fuel facilities, maintain them in good operational condition and provide aircraft refuelling services at Dubai International Airport safely, efficiently and on time, also making sure that the storage and into-plane facilities are expanded in time to meet the demand seamlessly and safely. In 1998, the oil companies acquired a newly constructed common Joint Industry Fuel Farm (JIFF). JIFF has an impeccable record of reliability and standards, and its operations are no less than a benchmark for the world, and have been awarded 'Excellent' rating four times in last five years by JIG.

Very few airports have seen growth like in Dubai International Airport.

In line with the growth of Dubai International Airport, the Fuel Farm is also undergoing further expansion in terms of storage, hydrant pumping capacity, and into-plane facilities. ENOC is the current Operator of JIFF on behalf of five oil companies that have exclusive rights to handle and supply fuel at the Airport.

While the Fuel Farm is common, the five oil companies operate their own into-plane facilities and market fuel individually in competition. Over 700 flights are fuelled each day. It is individual oil companies duty to bring their requirements to JIFF. They use their own pipelines to replenish product in JIFF storage tanks. The airport storage is currently fed by 2 pipelines belonging to joint ventures of the marketers, and a third one is nearly complete to meet the ultimate demand of the Airport.

JFR

The Role of the Airport Operator in the Jet Fuel Supply Chain

By Tony Astor of Astor Consulting Ltd

The most recent development has seen oil trading entities become direct fuel suppliers at a number of major airports,

Since the early days of aviation, the generally accepted practice at the majority of airports globally was for the oil companies to provide both the delivery infrastructure to the airport and the on airport storage and distribution infrastructure. This would also include the design, funding, construction, ongoing ownership and management of the fuel related assets at the airport. This allowed the oil companies to control and manage the entire fuel process, whilst the airport operator concentrated on airport operations.

More recently, the practice of major oil companies providing a comprehensive infrastructure service to the airports has changed. In the USA the common modus operandi is for airline consortium to own and operate airport infrastructure. In Europe and elsewhere globally the major oil companies are withdrawing from certain aspects of the fuel supply chain. Firstly, it was the intoplane function and the road haulage service of fuel that was split off and in recent times asset ownership of fuel depots and pipelines have moved from major oil company control to third parties.

The most recent development has seen oil trading entities become direct fuel suppliers at a number of major airports, including London Heathrow, currently the worlds largest outlet for jet fuel.

Historically, the practice of the major oil companies funding, developing and operating airport fuel infrastructure systems has served the airline and airport industry well. The track record on safety has been exemplary, as has the timely investment in providing new capacity to meet the growing needs of the airport, not forgetting the highly efficient operational practices and constantly striving to enhance best practice.

All parties in the fuel supply chain have a vested interest in ensuring the airport has a competitive fuel price.

The result of all these airport functions resting with major oil companies has, for the oil companies at least, some drawbacks. In most cases, all operational risks sits with the oil companies, together with the obligation for capital expenditure. With the advent of several global mega airports, such as Al Maktoum International in Dubai and a number of huge developments in China, the requirement for capital expenditure is vast, together with the provision of millions of litres of fuel for the dead stock. This is all against a backdrop of an industry where margins are already tight.

With the current trend of reduced input from major oil companies, some airport operators have seen major oil companies, firstly decline to fund new or expanded infrastructure, and subsequently some locations have seen long standing operational contracts not renewed on expiry. This shift has been gradual, and has resulted firstly, in the rise of the independent operator, such as ASIG and Skytanking, but secondly, it requires the airport operator to play a far greater role in the long term development of the airport infrastructure than was hitherto required.

All parties in the fuel supply chain have a vested interest in ensuring the airport has a competitive fuel price. A key factor in determining the fuel price at any given location is the efficiency and scale of the airport delivery and on airport infrastructure.

Increasingly, it is the airport that specifies or has significant influence on the concept for the airport fuelling system, whereas this was previously carried out by the major oil companies. In many cases a lack of inhouse experience results in the development of inappropriate airport fuel infrastructure. It is becoming

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The most common weakness seen when airport themselves specify fuel facilities, is the general over sizing of fuel storage tanks and hydrant pipe capacity,.

increasingly common to see airport operators over complicate hydrant systems, duplicate the facilities, embark on the installation of new and untested ideas, specify inappropriate or downright wrong materials and overlook basic features. But the most common weakness seen when airport themselves specify fuel facilities, is the general over sizing of fuel storage tanks and hydrant pipe capacity, whilst at the same time, often underproviding actual hydrant pumping capacity, sufficient to take account of the operational peaks and troughs.

Many airports use passenger numbers to forecast fuel volumes, often resulting in erroneous data, as passenger numbers alone rarely give an accurate picture. Fleet mix and route network play a far greater role in determining the airports fuel volumes.

For airports to successfully replace the major oil companies as the provider of airport fuel infrastructure and deliver appropriate facilities in a cost effective manner, then a number of basic steps need to be considered.

Detailed forecasts of the future traffic patterns need to be undertaken.

This allows the general size of the facility to be planned, and phasing of the new facilities to be considered. Often airports embark on twenty or thirty year plans, and similarly infrastructure development can be phased over the life of the expansion plan. This prevents oversized infrastructure being brought into service too early and thus burdening the airlines with higher fuel prices.

JFR

Tony Astor of Astor Consulting Ltd has over 30 years' experience in the airport business and fifteen years specialising in fuel related infrastructure issues. Since 2008 Astor Consulting Ltd has been advising a number of major global airports on how best to design and develop efficient and cost effective fuel related infrastructure. This in turn saves capital expenditure on behalf of the airport, saves unnecessary costs filtering into the fuel supply chain and thus avoids causing higher fuel prices for the airline community.

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Assuring Aviation Fuel is "Fit for Purpose"

By Mike Farmery

Exactly what is 'fit for purpose' and how do we assure it?

Clearly, everyone involved in the supply and use of aviation fuel wants it to be 'fit for purpose' but exactly what is 'fit for purpose' and how do we assure it? Fit for purpose must be more than just 'meeting spec parameters' because there are examples of fuels that have met the specification values but have subsequently caused operational problems. So, if the numbers are not enough, what is? This article describes the system that has evolved for assuring aviation fuels are fit for purpose wherever they are picked up. It is based on the triumvirate of meeting specification, traceability and quality assurance.

Fit for purpose is a term that is often used in the world of retail. We all know when we have bought something that is not 'fit for purpose'. There is nothing as frustrating as trying to open a bottle of wine with corkscrew that doesn't work or, even worse, breaks mid-task. Annoying but at least you can take it back to the shop and get your money back.

In aviation, assuring fit for purpose for all fuel wherever it is delivered is absolutely essential; it is hard to return jet fuel to the airport when you are flying at 35,000 feet, half way across the Atlantic.

Fuel specifications

Specifications are the fundamental tool for defining the characteristics that a fuel must have to be fit for purpose.

Specifications are the fundamental tool for defining the characteristics that a fuel must have to be fit for purpose. Specification groups like ASTM and the UK Aviation Fuels Committee bring together representatives from all the main stakeholder groups: the equipment manufacturers (like Boeing or Rolls-Royce, fuel suppliers (such as Shell or BP) and users (such as British Airways, Lufthansa and militaries). Today's specifications represent the accumulated wisdom of the industry over many years, often a direct result of learning from incidents. Moreover, with most engineering solutions, the resulting specifications are a compromise between often conflicting requirements such as performance, availability, cost, reliability, ease of manufacture.

It is really important to stress that the specification is much more than just the main table of test requirements like flash point, freeze point, distillation, existent gum etc. Within the specification there are many implicit and explicit assumptions and constraints. Until recently (2009), international jet fuel specifications only allowed jet fuel to be manufactured from crude oil using traditional refinery processes. Effectively, the specification is saying that provided we make jet fuel from the same materials that we have always used, using the same processes that we have always used and it passes our list of test requirements, our accumulated experience says that it will work satisfactorily in aircraft and engines.

One of the main reasons why the approval of jet fuel made from new sources using new processes (eg hydrogenated vegetable oils) has taken a relatively long time is that the industry had to test whether the same specification limits would be still able to guarantee the same level of performance in engines and aircraft.

Exxon have a nice phrase that captures this idea - 'make it right'.

Some of the implicit assumptions in the fuel specifications are quite subtle. Trace materials are a good example. In the jet fuel specification, there are no limits on all sorts of trace materials such as silicon and salt. In theory, they are prohibited by the catch-all requirement that 'jet fuel shall consist solely of hydrocarbons or approved additives'.

'Solely' implies zero but what is zero? With today's sophisticated analytical techniques, labs can detect parts per billion and the question how much is zero becomes an interesting question. Effectively the specification, which has been built up over many years, is saying that the typical day-to-day levels are ok because they are what we have got used to. But that immediately asks the question what about new feedstocks and processes? Are they going to introduce new trace materials that we need to worry about?

So, as long as we manufacture the jet fuel correctly, following the specification requirements and not doing anything significantly different to what we have done for the past 50 years, we know that aircraft and engines can cope with variations in composition and the typical levels and variations in trace materials. Exxon have a nice phrase that captures this idea - 'make it right'.

Quality Assurance

However, quality assurance is also critically important because, although it would be nice and simple, very few airports are supplied directly from refineries. Often supply chains are long and complex. In the supply and distribution system between refinery and aircraft we have also got to 'keep it right'. Quality assurance is setting up a combination of facilities and procedures that prevent contamination with other products or trace materials. At the airport, it is not practical to test the fuel for every known contaminant or trace material. We need to have confidence that the application of the QA procedures will be sufficient to assure no unexpected contamination. As noted above, even for fuels that fully meet the specification requirements, trace levels of unexpected materials can cause dramatic performance problems in engines and aircraft.

Just as in the specification world, there is an accumulated wisdom on how to look after aviation fuels in the supply chain. This has been developed and added to over the years as a result of experience and incidents. If we follow this best practice, we can have confidence that all will be well. One important piece of good news is that recently (October 2013) the new EI/JIG 1530 document 'Quality Assurance Requirements for the Manufacture, Storage and Distribution of Aviation Fuel to Airports' was

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Commercial aviation has a fantastic track record for flight safety and aviation fuels have been a very important contributor to that achievement.

published. For the first time, we now have a document, endorsed as best practice by the global fuel supply industry that covers all aviation fuel quality assurance upstream of airports. There was always good coverage of QA standards for airports but the supply chain was not so well documented. Now there is no excuse for not doing the right thing upstream of airports.

Also, as with fuel specifications, it is good to appreciate that we don't live in a perfect world. Jet fuel is not a pure chemical and it is transported at an industrial scale as a bulk liquid. The rules and guidance set out in EI/JIG 1530 represent what has worked over the years to prevent bulk contamination with other fuels and pick up of trace contaminants. However, even when we are comparing test results from contamination sensitive properties like freeze point or flash point (for example, in the Recertification Test defined in 1530), there could be up to 0.5-1.0% of gas oil mixed with the jet fuel and we would not be able to detect its presence. This level of discrimination has been perfectly adequate for over 40 years and aircraft have operated perfectly well. Interestingly, it was the introduction of FAME (Fatty Acid Methyl Ester - the bio-component in biodiesel) that suddenly required that the crossover of biodiesel into jet fuel had to be less than 0.01%. This has proved to be a tremendous challenge for the industry and explains why there has been so much interest in achieving approval for 100 ppm of FAME in jet fuel compared with the current 5 ppm.

Traceability

The final piece of the jigsaw that complements the 'make it right' and 'keep it right' mantras is traceability. Traceability is one of the underlying principles that has contributed to commercial aviation's fantastic record for safety and reliability. Every important component on an aircraft must have been manufactured as an aircraft component and must be traceable back to its point of manufacture. Traceability provides two key benefits: it ensures that only genuine products, produced to the right specification and using the correct materials and techniques are used in aircraft; traceability also enables long-term performance to be related back to original design and manufacture so that the aviation industry is able to learn from incidents and instigate changes to prevent them from recurring.

When applied to aviation fuel, traceability ensures that a batch of aviation fuel was manufactured specifically as aviation fuel and was originally certified by a refinery as meeting an aviation fuel specification. Crucially, it means that it is not any old mixture of molecules that happens to meet the minimum or maximum limits of the tests in the main table of the fuel specification. The reason that meeting the numbers is not good enough goes back to the piece on fuel specifications. They work because we use the same traditional crude oils and traditional processing, and refineries adhere to the rules in the specification. If we take any batch of hydrocarbons and just test against the specification parameters in the main table of requirements, we have no idea what trace or unusual materials are present. Experience tells us that the standard laboratory test methods may not detect them, we cannot take the risk that aircraft engines might be more sensitive than the routine laboratory test methods!

Essentially, assuring fit for purpose is based on accumulated experience and wisdom built up over many years and incorporated into ways of working. Implicit in all of it is the need to be particularly vigilant for any change that might undermine the effectiveness of the triumvirate. Consequently, management of change is an absolutely essential process and is embedded into the way the industry develops and moves forward. Everyone working in the industry needs to have a mindset based on the old adage 'when in doubt, don't assume, ask the question'.

Commercial aviation has a fantastic track record for flight safety and aviation fuels have been a very important contributor to that achievement. It is all about assuring that aviation fuels are fit for purpose wherever in the world they are loaded into aircraft. That fitness for purpose is achieved via a combination of specification, traceability and quality assurance. Just like a three-legged stool, you need all three!

JFR

In 2015, Mike Farmery will be running workshops 'Assuring jet fuel quality in the supply chain' in London and Singapore. Each one-day workshop will cover fuel specifications, quality assurance and traceability in detail and include an interactive Q&A session on common problems and how to avoid them.

The workshops are aimed particularly at fuel buyers, traders, fuel suppliers, terminal operators and laboratory managers who want to learn more, understand the risks and avoid making costly mistakes. Of course, anyone interested in the subject is very welcome!

For further information, email

Dublin Airport's Open Access Fuel Supply

By John Pitts, Managing Director e-Jet Consultants

The current aviation fuel facility dates back to 1972 and its storage capacity is no longer adequate.

As reported in the Armbrust Daily Briefing on 28 July this year, Dublin Airport Authority (daa) as part of its plans to upgrade the fuel farm and related facilities at Dublin Airport, have awarded a partnership, of RPS Group (www.rpsgroup.com) and e-Jet Consultants (UK) Limited (www.jeta1.com) a consultancy service agreement to assist in the procurement of a Concessionaire to deliver the proposed redevelopment and operate the facilities under an Open Access arrangement.

The current aviation fuel facility dates back to 1972 and its storage capacity is no longer adequate to support the airport's carriers current fuel demands or envisaged growth.

Accordingly, daa have embarked on a project to increase jet fuel storage in the Existing Fuel Farm, move the into-plane fuelling operations from landside to a new airside location and commission the hydrant system which was installed around Pier 4 during construction of passenger Terminal 2.

daa plan to go to market towards the end of this year to procure, on a concession basis, an experienced fuel facility operator to develop the facilities. The development will be tendered on a design, finance, build, operate and transfer ("DFBOT") basis.

The successful party will operate the Fuel Farm for a fixed term. In order to prequalify suitable applicants, a request for information questionnaire was published on e-tenders 24th October.

This continues to be one of the most significant jet fuel initiatives taking place in Europe at the moment,.

In the first instance, the Concessionaire will take over and continue operation of the Existing Fuel Farm for a transitional period (expected to be of the order of two years) during which time design, construction and commissioning of new fuel facilities will take place. The development will involve the installation of 3 new larger aviation fuel tanks on the site and the construction of new aircraft refuelling infrastructure (airside Into-Plane Facility and activation of the existing Pier 4 hydrant system as well as a new spur hydrant to Pier 3). The concession arrangement will also cover other developments such as future expansions of the Fuel Farm and additional fuel hydrants to serve other parts of the Airport.

The Project will become an open access facility once the Concessionaire takes it over. This means that any qualified supplier that complies with certain requirements in a standard form agreement will be able to store fuel inventory in the Fuel Farm and have access to, and use of, the facilities on a non-discriminatory basis in return for payment of a Throughput Fee. This in turn will enable airlines to freely select the suppliers of their choice to supply fuel for their aircraft at the Airport.

The Concessionaire will act as bailee for each supplier, storing and handling Jet A-1 through the Fuel Farm up to the point of bowser loading in the Into Plane Facility or the hydrant pit valve in the case of the hydrant facilities. Separately-appointed Into-plane Agents will take custody of the fuel from the hydrant or Into Plane Facility until it is delivered to aircraft.

Consultant's Project Manager, Cormac Bradley of RPS, commented, "Since our appointment in July, significant progress has been made on this project, and we are confident that the project will meet the exacting timelines which have been set".

The Throughput Fee per unit volume for use of the fuel farm and hydrant system will be the same for all, regardless of volume, length of contract etc. This provides a level playing field at the airport.

John Pitts, MD of e-Jet, added, "This continues to be one of the most significant jet fuel initiatives taking place in Europe at the moment, both in terms of much-needed infrastructure development, but also in the commercial framework which is being developed".

As GM of AFSC, John was part of the inception of Open Access fuel supply at the new Hong Kong International Airport which opened in 1998. With the advent of Open Access, the commercial canvas changed

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Whilst the North American model allowed some flexibility in airlines' procurement strategies, constraints outside of the airport could limit opportunity to those suppliers who had access to relevant pipelines.

significantly. Because it was ground-breaking, more than two years of planning and negotiation was required in order to ensure that Open Access worked for all parties from Day One. Dublin hopes to shorten this time frame, so that the Concessionaire is in place next year, and the new fuel facilities are operational in 2018.

To recap on Open Access, in North America since the 1970's it had been the practice for fuel suppliers to deliver jet fuel into bulk storage at the airport, and for third parties (airlines, airports, independent operators) to take responsibility from that point onwards – the point of sale often being the airport fence so that in effect, airlines would hold their own inventory within the airport and draw down from it.

Contrast this with what was the practice in the majority of locations at the time, whereby ownership of on-airport fuel facilities (fuel farms, hydrants etc.) was with the oil industry, and the opportunity to supply to an airport was only open to the owners of the facilities there.

Whilst the North American model allowed some flexibility in airlines' procurement strategies, constraints outside of the airport could limit opportunity to those suppliers who had access to relevant pipelines. In other words, whilst access was probably better than the model implemented in the rest of the world, full Open Access was not yet in place.

Outside of North America in this period it would have been be typical for major carriers to have some form of stake in the fuel facilities at their home base, although not necessarily being in the position to govern policy or self-supply fuel. When the new Munich International Airport was developed in 1992, there was improved access because the on-airport fuel facilities were owned and operated by a consortium which included several airlines having a major stake in the airport. Coupled with facilities which provided for fuel receipt by pipeline, rail and road from the outset, this allowed airlines to procure from many suppliers who were willing to supply. However full Open Access was not yet in place because fuel supply was not completely decoupled from facility ownership.

Dublin is currently taking the opportunities presented at an established airport.

Naturally, the greatest possibilities for new initiatives, such as Open Access, generally occur when there are no legacy issues; however the opportunities for greenfield airport developments are few and far between.

Dublin is currently taking the opportunities presented at an established airport. When Open Access was planned for in Hong Kong, the airlines requested the greatest possible flexibility of choice in the way that jet fuel was delivered all the way to the aircraft wing. The commercial aspects of the jet fuel facilities which resulted in Hong Kong may be summed up as:

1.providing a secure means of fuel supply and adequate inventory for the operational life of the airport;
2.making Jet A-1 cost effective;
3.giving a free choice of qualified Suppliers for the competitive supply of fuel to the airlines at the airport;
4.making the supply of jet fuel to the airport as open as possible as a result of receipt by barge – so that all fixed infrastructure was within the airport's control
5.ensuring that the throughput fee for the users of the Facility is fair, non-discriminatory and reasonable;
6.participation by interested parties in the regulation of the fuel operation;
developing the facilities on an on-going basis (e.g. the recently-opened Permanent Aviation Fuel Facility which provides for receipt by ocean-going vessels).

Dublin is looking to follow a similar path.
JFR

Readers may be aware that the most recent IATA Fuel Forum was held in Dublin in May of this year, and it is planned that further updates will be given from time to time.

Guest commentary...

The Key Work of the IATA Fuel Group -

A Personal Perspective from Mike Farmery

Whilst it is always dangerous to imply some stakeholders are more important than others, airlines are at the sharp end of our industry.

The technical world of jet fuel is a busy place and the IATA Fuel Forum has become a great place to see what is going on. Dubai should be no exception!

The Fuel Forum not only brings together all of the key stakeholders in the aviation fuel industry, it is unique in that it attracts a large contingent of users (ie airlines). Whilst it is always dangerous to imply some stakeholders are more important than others, airlines are at the sharp end of our industry. They provide great input on what matters to them, topics such as fuelling safety, fuel efficiency, operational standards, turnaround times, supply integrity etc. This feedback helps the technical world keep focussed on important and not just interesting issues.

The Fuel Forums are also unique in that they bring together both technical and commercial groups. Years ago the two groups worked in very separate silos and rarely came into direct contact. There were many things wrong with this arrangement. Firstly, fuel buyers, who are in a strong position to create change, were often unaware or insulated from the technical issues of the day. Secondly, the commercial staff in both airline and supplier companies (who could have a major say in budgeting within their respective companies) were often unaware of the hard work and dedication of the technical community. Last, but not least, by joining the two communities together, us 'techies' could experience some of the luxury and glamour that our commercial colleagues would take for granted. Technical meetings were now in wonderful hotels instead of dark, windowless basements. The techies are now more sophisticated. Whilst it will be a while before we are wearing Amani, it is clear that overalls and eau de kero are already passé.

So what are the big agenda items in the technical world? Hard to know where to start.

So what are the big agenda items in the technical world? Hard to know where to start but here is a personal view, not necessarily in order of importance.

The Surabaya Incident was a big wake up call to the industry and came close to destroying the great track record for fuel quality not being the cause of a major accident. We learnt a great deal from the investigation and many corrective actions were implemented by various groups such as JIG, EI, ICAO etc. Although it has been discussed a great deal at Fuel Forums, improving the coverage and quality of quality assurance at all airports wherever they are has proved difficult. Therefore the agreement between IATA and JIG to work together on areas like standards, inspection and training is a great step forward and likely to result in real improvement. It could represent the final piece in the jigsaw.

The growing importance of trading and shipping in the efficient supply of jet fuel around the world is the result of many structural changes in the industry such as: oil majors selling/ closing old or small refineries, new suppliers and mega refineries, airlines self-supplying and new demand patterns. Recognising the growing complexity of supply chains, changes to the DEF STAN 91-91 fuel specification have been introduced to clarify and tighten up traceability and documentation flows. By following these and other industry requirements, fantastic volumes of jet fuel are moved around the world without problem. However, it can occasionally go wrong and the session on the Joint Commercial and Technical Day highlighted that particulate contamination on ships probably carries the highest risk. Improved measurement and quantification of dirt levels is necessary and there is work going on in fuel specification groups. Soon we will need to agree acceptable limits for particulate contamination at different points in the supply chain. Fortunately, the industry is well equipped with effective micro-filtration to remediate cargoes if problems do occur. If you want to know more, the Energy Institute Handbook on Filtration (EI 1550) is a great source of education and guidance. The launch of the 2nd Edition at the Dubai Fuel Forum is great

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After endless reports that 'we are almost there now', we are almost there now.

evidence of the industry's commitment to continuous improvement.

One of the great 'old chestnuts' (an English phrase meaning something that has been hanging around for a long time) in the technical world has been the FAME issue. This topic has been discussed and reported on at IATA for the past 8 years (a few disparaging observers have likened it to a soap opera). However, with the high profile that this subject received at the Fuel Forum and the obvious supply risks, airlines (both commercial and technical sides) have been strong supporters of the joint industry project (managed by the Energy Institute) to increase the approved FAME level in jet fuel from 5ppm to 100ppm. After endless reports that 'we are almost there now', we are almost there now. Unfortunately, 'there' is not quite where most people wanted to be but it is better than nowhere. Instead of the 100ppm, it is now very likely that the FAME limit will be raised from 5 ppm to 50 ppm. All involved in the supply chain, plus airlines operating out of high-risk airports, will breathe a collective sigh of relief. On the negative side, there are a few technical people who feel like they have lost an old friend and will have to look for another reason to get out of bed in the morning.

As a result of IATA's ambitious CO2 reduction targets combined with a desire for less dependence on crude oil, biofuels continue to have a high profile in the industry. With the recent approval of the Amyris/Total process, there are now three approved pathways to manufacture bio components for blending into jet fuel. There are a couple of sessions at the Dubai Fuel Forum that illustrate that there seems no limit to human creativity when it comes to converting bio or waste material into hydrocarbons for jet fuel. There are already many other process/ feedstock combinations in the approval pipeline.

It is not just new fuels from alternative or renewable sources that need approving.

Unfortunately, like many of the pipelines that we use in the industry, the capacity of the approval pipeline is limited. This is not surprising; approving anything in aviation is never going to be quick given our obsession with safety. We have to be especially careful with aviation fuel because it is not duplicated or likely to failsafe if something is wrong with it (Surabaya was a good example). Specification groups and especially ASTM have tried hard to clarify, simplify and streamline the approval process for fuels and additives. Over the past 10 years, many people have worked hard to improve the industry standard ASTM D4054. However, even if the process is streamlined, it is the airframe OEMs and engine manufacturers who are effectively the gatekeepers and they have limited resources. The OEMs are primarily resourced to support existing engines or airframes or develop new ones. Approving new fuels started as a bit of a sideline in response to airline and producer interest but now it has become nearly a full time activity. New and innovative approaches are needed, together with new sources of funding.

And it is not just new fuels from alternative or renewable sources that need approving, at the moment a surprisingly large number of new additives are being put forward. This is great for an industry that traditionally has used old legacy additives or been dependent on single manufacturers for an approved additive. At the moment, there are three new additives waiting approval: a new static dissipator additive, a new lubricity improver and a new water management additive. The pipeline is becoming rather crowded. As with fuels, all these new additives are placing great pressure on the OEMs and creating some frustration for the fuel or additive developers. Building a business case for a new fuel or additive is difficult enough. But when timescales keep getting extended through no fault of their own, those providing the funds can start to feel nervous.

One of the consequences of all the approval activity in the past few years has been a great deal of work focussed on understanding whether parameters in the specification really do define fuels that are fit for purpose in all circumstances. Recently, the OEMs have raised the issue of viscosity. In both the ASTM and DEF STAN specifications, viscosity is measured and controlled at -20 ^{o}C. We know fuels are often handled on aircraft well below this temperature (especially in APUs) but -20 ^{o}C was chosen as a relatively easy temperature to work with in labs. Moreover, it was previously thought that you could

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The IATA Fuel Forum is a unique meeting; a place where Amani meets Eau de Kero.

predict (and therefore control) viscosity at lower and more common temperatures like -40 °C from the value at -20 °C. The OEMs presented data at the Dubai Fuel Forum showing that the control of viscosity at -20 °C does not work for controlling the behaviour of all fuels at -40 °C. This is a really interesting finding and we may be looking at a significant change to the fuel specification.

In the past 50 years, commercial aviation has changed dramatically, and it is not just faster, higher and lower ticket prices. Aircraft are more efficient and much quieter, engines stay on wing for 30,000 hours or more. In the cockpit there are glass screens everywhere, computers, autopilots and satellite navigation. In the cabin, there are hundreds of movies and games and flat beds and even suites for those who can afford them. Ironically, outside on the ramp the equipment fuelling the aircraft hasn't changed that much. Essentially it is still pumps, pressure control valves, filters, hoses and couplings. Ger O'Donnell's father who started fuelling aircraft in 1957 would not notice much difference apart from much higher flow-rates and finer filtration.. It is therefore great to see sessions like the one in the TFG in Dubai that focussed on developments in electronic sensors to improve the fuelling operation. Sensors are being developed to monitor fuel cleanliness (dirt and water), control pressure and flow and measure density. It may be that taking samples in glass jars and using hydrometers etc will soon look quite primitive. However, there is a 'but'.

Sensors could hold great potential for improving and automating the into-plane fuelling process but we need to be absolutely confident that they function very reliably. An airline, with a plane full of passengers waiting to leave the gate, would not want the into plane agent to ask "Can you wait 30 minutes? We have an unusual reading from one of the sensors and we need time to work out whether it is real or not".

Jet fuel is a very busy place at the moment and there are many different technical groups around the world working hard to improve what we do in areas like specifications, equipment and procedures. The IATA Fuel Forum is a unique meeting; a place where Amani meets Eau de Kero. A place where we can all find out what is going on in the technical world. It is also a great place to join in!
JFR

Sir Richard Branson used the keynote address at the 2014 BIO International Convention in San Diego to call for more direct action by private industries to curb Co2 emissions and promote global health.

Sir Richard Branson Addresses International Bio-Convention

By Special Correspondent, David Ward

Generating aviation fuel from aluminum production waste and algae were among the solutions suggested by Virgin Air founder/ billionaire philanthropist Sir Richard Branson as he used the keynote address at the 2014 BIO International Convention in San Diego to call for more direct action by private industries to curb Co2 emissions and promote global health.

In a wide-ranging keynote/ interview conducted by BIO CEO Jim Greenwood, Branson noted the current fossil-based energy consumed by industries and consumers is already having an impact, adding, "Over the next 100 years we could do irreparable damage to the world."

While he was short on specific solutions, he did suggest that Virgin Atlantic and its sister airlines in the U.S. and Australia are committed to driving the use of alternative jet fuels. In 2008 Virgin was the first carrier to test fly using biofuels and in 2011 Virgin Atlantic partnered with New Zealand-based LanzaTech to convert industrial waste gases to jet fuel. Branson used the keynote to again tout the partnership.

"There are companies out there like LanzaTech--a little company in New Zealand--that has come up with the brilliant idea of collecting the waste product from aluminium plants and steel plants," he explained during the keynote. "So instead of going up the chimney they are recycled through and come out as aviation fuel and Virgin Atlantic will hopefully one day benefit from that."

Branson also touted other potential feedstocks. "Algae-based fuels, isobutenol-based fuels--these are the kinds of fuels that bio-tech companies are working hard to get produced in enough quantity to feed the airline industry and hopefully other industries as well," he told the gathered audience of more than 2,000 who gathered in the San Diego Convention Center to hear him speak, adding, "I would urge as many companies in this room to get into this space as possible."

Branson even suggested that the right aviation biofuel solution may end up winning the $25 million Virgin Earth prize, a contest to see who can come up with the most effective way to extract carbon from the atmosphere.

Sir Richard Branson

"We've had 10,000 submissions so far," he said. "No breakthrough winner yet (but) I actually think this is a prize that can be won. And if you can extract enough carbon, you can potentially save the world."

Branson, who said he was donating his keynote fee to one of his many charities, also talked about some of his adventures, including his record-breaking balloon flights--and he took a few good natured swipes at UK commercial aviation rival British Airways.

But in general, Branson stayed positive, encouraging businesses to take a real interest not just in making money, but also improving the world.

"Go into a business if you can make a real positive difference," he said.

JFR

The right aviation biofuel solution may end up winning the $25 million Virgin Earth prize.