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D3.3 Recommendations on how to solve potential barriers to large-scale commercialization

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Executive summary

Identify and solve potential barriers is the key to creating a modus operandi for biojet which will simplify the introduction of that product in the market. Decreasing the impact of introducing biojet on the logistic chain will make this product more attractive and it would be easier to introduce biojet on the market.

In order to achieve that goal, efforts should be put in creating a simple mass balance system from the producer to the end user, which assigns the sustainability characteristics to the end user at airport based on the product that has been introduced.

It is also relevant to simplify the analysis of the biojet, testing the product according to D7566 at the production point and after that, treating the product as non-conventional fuel according to the criteria of ASTM D1655 or DEF STAN 91-91.

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Definitions

ASTM D1655: Standard Specification for Aviation Turbine Fuel. This specification defines the minimum property requirements for Jet A and Jet A-1 aviation turbine fuel and lists acceptable additives for use in civil operated engines and aircrafts. Specification D1655 is directed at civil applications, and maintained as such, but may be adopted for military, government or other specialized uses.

ASTM D7566: Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons. The main part of this standard contains the specifications for synthetic jet fuel blended with Jet A or Jet A-1. Once certified, the blended jet fuel batch is automatically recertified to ASTM D1655 and considered a drop-in fuel batch. Blending is only allowed after the neat synthetic jet fuel batch is certified to the applicable Annex of D7566. Each Annex belongs to a specific synthetic jet fuel production pathway; a total of five pathways are currently certified.

DefStan 91-91: “Defence Standard 91-91”, the Aviation Turbine Fuel (Kerosene Type, Jet A-1) standard developed by the UK Aviation Fuels Committee (AFC) on behalf of the Ministry of Defence (MOD). Developed for use in the UK, but today also used in many European countries.

EI/JIG 1530: Quality assurance requirements for the manufacture, storage and distribution of aviation fuels to airports. EI/JIG 1530 provides a standard for maintaining aviation fuel quality, from production through (sometimes complex) distribution systems to airports. It provides mandatory provisions and good practice recommendations

1 Introduction

The objective of this document is to analyze the logistic chain currently implemented for the fossil fuel, in order to identify potential barriers that should be solved for biojet. That information would be the key to creating a modus operandi for biojet which, taking into account all quality assurance procedures, will simplify the introduction of that product. Decreasing the impact of introducing biojet on the logistic chain will make this product more attractive and it would be easier to introduce biojet on the market.

2 Potential barrier identification

2.1 Traceability

It is also important to consider traceability aspects. For kerosene, it is necessary to have a robust system to assure that it is possible to check the origin of the sample and the quality on each step of the logistic chain, as detail on JIG/EI 1530. Once the alternative fuel has been mixed up to 50% with jetA1, the criteria that should apply are the same that the ones for conventional fuel. But additionally, in order to control the amount of alternative fuel, a simple mass system should be defined, otherwise that could become a barrier to use that product.

Related sustainability aspects should also be considered. As mentioned before, it is necessary to allow this product to be used in the current unsegregated systems; otherwise additional investment should be done, generating a significant barrier. If the product is mixed up to 50% and latter treated as conventional jet fuel, as proposed before, a sustainability certificate should be received together with the Certificate of Analysis of the alternative fuel. The amount of biofuel introduced in the system, together with the sustainability percent should be assigned to the introducer of the system, and following a mass balance that percent would be reassigned at the final step. Traceability in unsegregated systems is only possible on paper as in practice the molecules end up in the entire fuel system.

The proposal is to simplify the process as much as possible, always complying with the sustainability criteria stablished by the European Commission. That could be achieved using a global mass balance, considering a logistical system as a single system, which could fit in the definition from 2010/C 160/01: “logistical facility or site (defined as a geographical location with precise boundaries within which products can be mixed)”. Within the system, sustainability characteristics would remain assigned to consignments. When consignments with different sustainability characteristics are mixed, the separate sizes and sustainability characteristics of each consignment would remain assigned to the mixture. If a mixture is split up, any consignment taken out of it can be assigned any of the sets of sustainability characteristics (accompanied with sizes) as long as the combination of all consignments taken out of the mixture has the same sizes for each of the sets of sustainability characteristics that were in the mixture. A common system in Europe is a fungible system owned by one operator, where fuels meeting the same specification belong to different clients. That system would act as a global system where each consignment has a specific size and certain sustainability criteria associated, and at the end of a certain period, the amount of biofuel and the sustainability that ingress the system has to be the same than the amount and sustainability that is released.

Each consignment should include the following criteria:

- Type of biofuel
- Type of raw material
- Country of origin of the feedstock
- Greenhouse emission figure
- Compliance with sustainability criteria (land related)

The situation described fulfils the Directive’s sustainability criteria; however it is not clearly included in any recognised scheme for certifying sustainable biofuels. The inclusion of a global system balance considering a whole logistic and storage facility system, as shown in figure 1, should be included to promote the use of biojet.

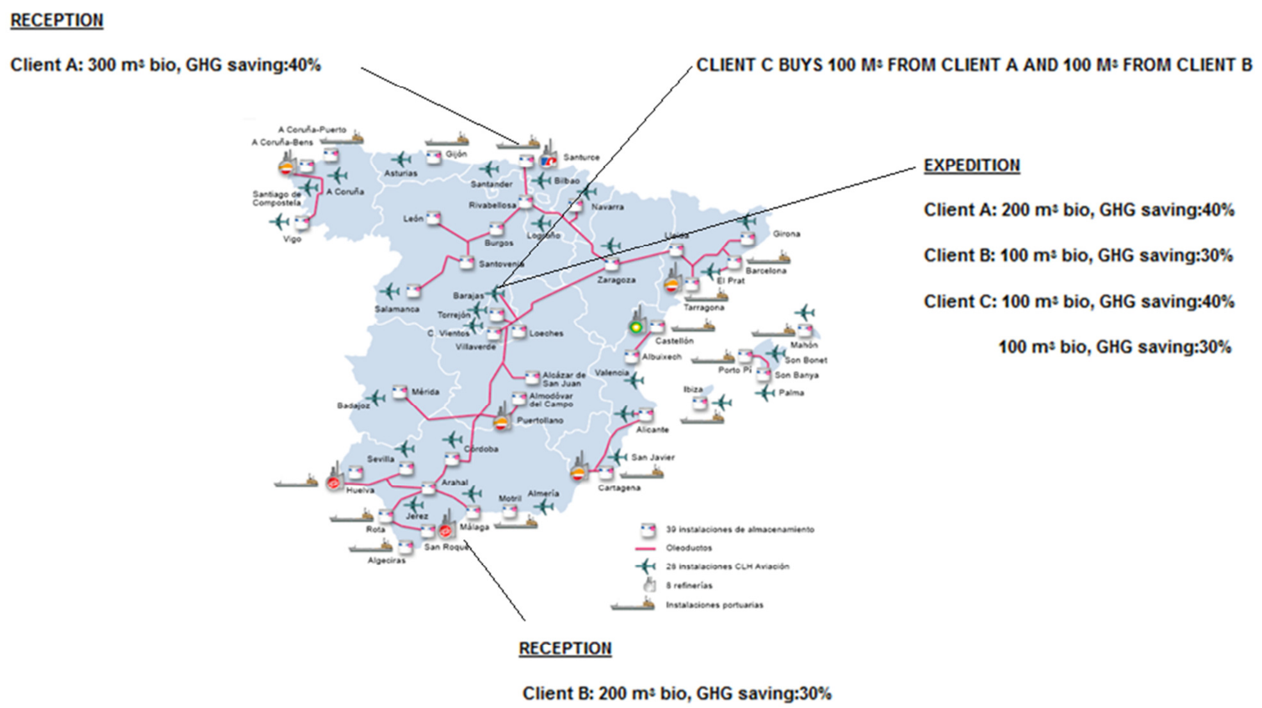

Figure 1- CLH logistic system

Figure 1 shows an example of a common European fungible pipeline system (CLH, Spanish logistic system).

That type of systems enables operators, to deposit their products at one facility and collect them at another immediately, so that they can make use of their products at multiple points in different geographical areas, increasing flexibility. The system operates following a global mass balance, where each consignment that is introduced into the system, is registered with the corresponding sustainability criteria, which are reassigned when the products in delivered. That situation will promote the use of biojet because it will simplify logistic and will reduce costs, avoiding the need of transportation of bios from manufactures point to refinery and then again to the end consumer at the airport.

The proposal is to allow logistic systems to be certified in voluntary schemes that have been recognized by the European Commission, following a global mass system balance that takes into account the whole system, logistic and storage facilities, in order to assign sustainability characteristics to the end user at airport.

2.2 Testing and certification

Jet fuels from non-conventional sources, should comply with ASTM D7566 “Standard specification for aviation turbine fuel containing synthesised hydrocarbons”. This specification defines the requirements for aviation turbine fuel containing up to 50 % synthesised hydrocarbons, and the quality of the synthesised blending components. Some parameters defined for the non-conventional fuel differ from the requirements stablished for conventional JetA1, being some of them especially restrictive, which is explained in depth in D3.1. That situation represents the first potential barrier, as not all the labs equipped for JetA1 testing have the equipment needed for some of the D7566 requirements. To solve that situation, biojet should be analysed at the point of manufacture and after that, mixed with conventional Jet fuel up to 50%, which could be considered as Jet A1 complying D16566 and DEF STAN 91-91. That modus operandi meets the requirements stablished on JIG/EI 1530:

“Certification of a jet fuel blend containing synthetic components to ASTM D7566 is intended only as a step to recertification to D1655 or DEF STAN 91-91, before product enters a distribution system supplying an airport. It should be noted that once the fuel has been certified to D1655 or DEF STAN 91-91 it should never re-enter the D7566 process.”

“Once the synthetic fuel blend has been created, a batch defined, and the batch tested in accordance with either ASTM D7566 Table 1, Parts 1 and 2, or DEF STAN 91-91, a CoA can be issued confirming compliance of the batch with either ASTM D1655 or DEF STAN 91-91. All of the requirements for batching, certification and release detailed in section 8 shall apply.”

The problem is that this situation forces suppliers to mix always non-conventional fuel with conventional kerosene before transportation, which complicates the process and decreases the transportation capacity. As D7566 is intended to control the quality of the production process, it seems more coherent to have an initial CoA following that standard and after that, certifying the non-conventional fuel according to the criteria of ASTM D1655 or DEF STAN 91-91. That will allow transportation of pure alternative jet fuel from the manufacture point to an intermediate logistic, testing that there according to ASTM D1655, and after that, it could be mixed up to 50% and treated as conventional jet fuel.

The second barrier is the minimum aromatic content, which should be greater than 8%. This requirement only applies to non-conventional fuels, according to ASTM D7566 : “The minimum aromatics and distillation slope criteria only apply to aviation turbine fuels containing synthesized hydrocarbons produced to this specification and are not applicable to conventional aviation turbine fuels produced to Specification D1655. Some batches of aviation turbine fuels produced to Specification D1655 may not meet the minimum aromatics and distillation slope criteria specified in Table 1 of this specification.”

Taking into account that HEFA has a maximum aromatic level of 0.5 % m/m, conventional jet juel used for the 50% blend should have more that 16% m/m of aromatics. In order to follow that requirement a specific jet fuel in needed, complicating the process and making many batches not suitable for blending with alternative fuel.

The following figures show the aromatic percent in the UK in 2009 and in 2013.

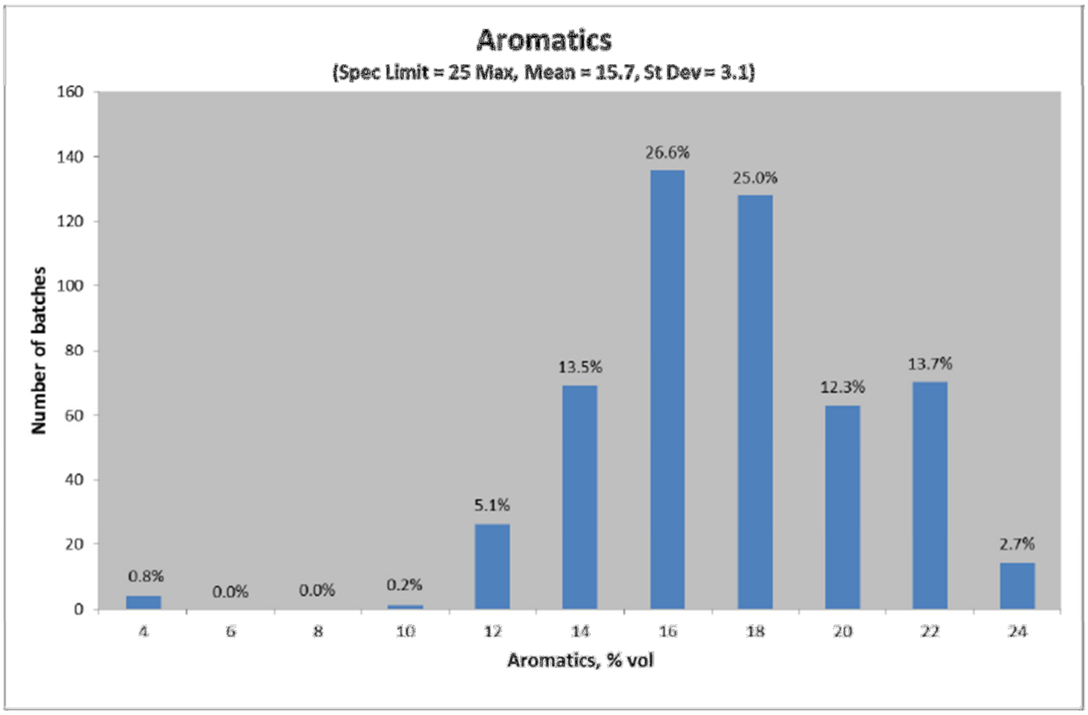

Figure 7, Aromatics Histogram 2009

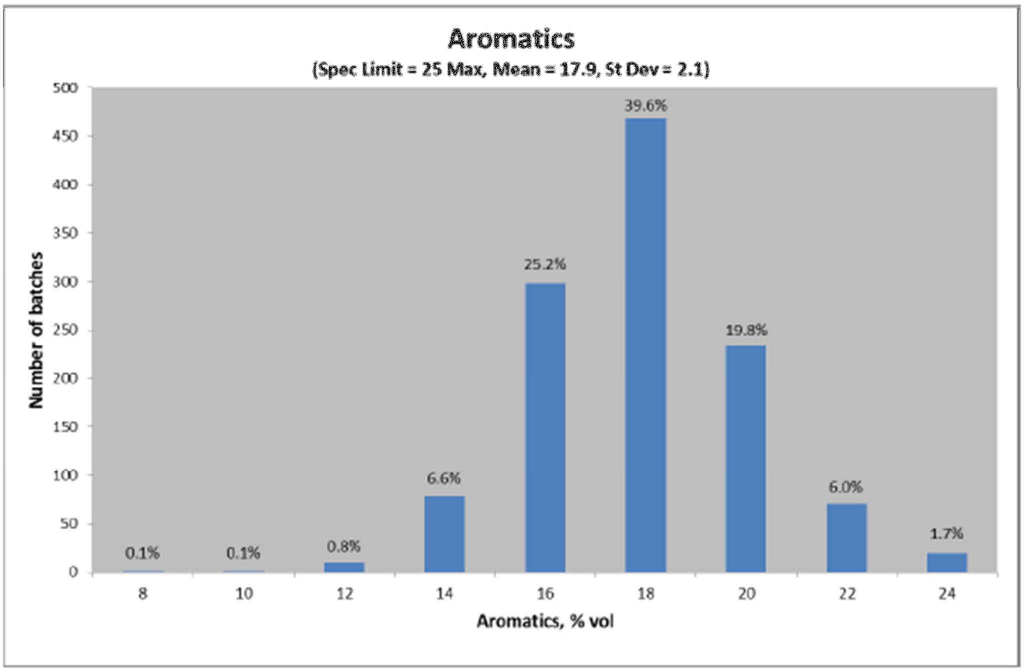

Figure 11, Aromatics Histogram 2013

In the previous example, batches with a percent of aromatics lower than 16% (not suitable as blendstock with alternative fuel up to 50%) is between 7.6 to 19.6%, and could be even higher as there is no limit on the specification.