THE COMPARISON OF THE INPUT COST IMPACT OF AVIATION FUEL AT THE INTERNATIONAL AIRPORT

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The article is dedicated to the theme of the comparison of the aviation fuel input cost impact at the international airport. This article sketched a way of the aviation fuel securing as well as the environmental, human health and life securing. Paper also discussed the input costs of the storage facility and the proposal how to improve the operability and economics.

Keywords: securing, fuel, distribution, costs

INTRODUCTION

Man was long ago enthralled by the possibility of flying. From Icarus' wings to DaVinci's flying machines to lighter-than-air balloons. But what was lacking was a means of propulsion. This finally became available in the early years of the 20th century with the development of the internal combustion engine. The article gives information about the types of aviation fuels as well as characteristic of the most widely used aviation fuel JET A-1. Distribution system includes a fuel transport from the refinery to the airport storage facility by the different modes of transportations, carrying fuel, fuel storage phase and the final implementation to the aircraft by the tankers or hydrant system. It also contains information about the costs for the operation of a tax warehouse, investment costs as well as operating costs including vehicle costs, personnel costs and energy and water costs.

1 SECURING OF AVIATION FUEL

Each mixture must comply with conditions that are essential for quality. It is the same with aviation fuel. Currently there are different types of aviation fuel having their properties and quality requirements. An important part of this chapter is distribution and storage of aviation fuel.

According to the used engine, the fuel can be divided to the fuel based on aviation gas (Avgas) and based on the aviation kerosene – JET A-1, JET - A, JET B, TS-1.

There are a several types of fuel based on aviaton gas used nowadays and they are divided according to the octane number. The modern type of aircrafts use Avgas 100LL with low content of lead and Avgas 100 and the older types of aircrafts use Avgas 91, 80. All fuels based on air kerosine are produced by direct distillation of oil with addition of the necessary ingredients for each type of fuel. These ingredients include substances to achieve electrical conductivity, thermal stability, antioxidants, lubricants and anti-freeze additives.

1.1 Aviation fuel JET A-1 and its quality requirements.

Aviation kerosene JET A-1 is fuel for aircrafts equipped with turbines or engines designed to achieve supersonic or subsonic speed. Technical requirements for the quality of kerosene are extremely difficult to comply with strict safety and operating instructions of air transport. It is also intended as an alternative fuel for diesel engines of land military technology.

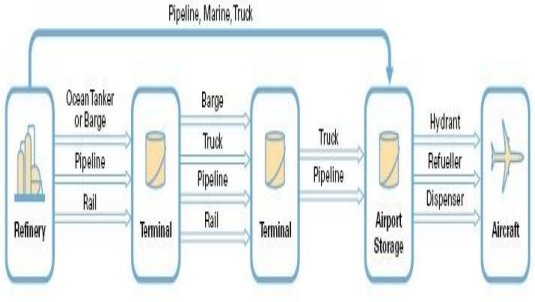
Kerosene JET A-1 is colorless, but sometimes has a yellowish color and it stinks. JET A-1 is a mixture of hydrocarbons having a boiling point up to 300˚C. Various additives are added to the fuel to improve the quality of fuel JET A-1. The content and nature of these ingredients is given by the manufacturer in agreement with the customer. JET A-1 belongs to II. Class B biological activity under directive "Safety precautions with petroleum products". Kerosene JET A-1 is also in II. Hazard class as a flammable liquid according to ČSN 65 02 01.

The Quality securing is effected with these tests: millipore test, density and temperature control, by using an aerometer, visual inspection of the sample, hydrokit test, conductivity detection control and water content control.

1.2 Distribution of aviation fuel

Fuel receipt, storage, and much of the equipment associated with distribution of aviation fuel are located groundside, some distance from passenger terminals, runways, taxiways and flight lines. It must then be moved to an airport, and finally, pumped into the tank of an aircraft. The fuel may be shipped directly to an airport fuel storage facility, but usually the distribution chain includes one or more intermediate storage facilities (terminals).

Fig. 1 Distribution system



Several modes of transportation may be used: pipeline, ship, barge, railroad, and tanker truck.

Fig. 2 Pipeline

Fig. 3 Ship

Fig. 4 Railroad

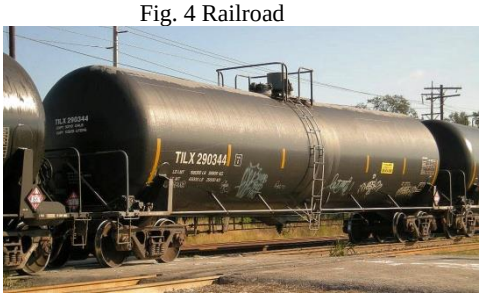


Fig. 5 Tanker truck

Most airports have fuel storage facilities configured for tanks to supply the product either directly to refueler trucks or to an underground hydrant fueling system. For jet fuel storage, most airports have at least two tanks, one in the receiving mode, and the other in the distribution mode. This segregation of the incoming fuel allows the operator to perform standard quality checks on one batch of fuel, with adequate time for any water suspended in the product to settle to the bottom of the tank. This is necessary to avoid distributing fuel that does not complies with specifications, or has water contamination. Avgas storage facilities may consist of only a single tank, since Avgas is not adversely affected by trace amounts of water in the product.

Fuel storage tanks come in many shapes and sizes, but are usually classified as aboveground, underground, or cut and cover. Aboveground tanks are made of steel, and are either vertical / cylindrical in shape, with large capacity tanks being field-erected, or horizontal / cylindrical, usually prefabricated and thus of lower capacity. Underground tanks are horizontal / cylindrical in shape and can be of single or double wall design to provide integral secondary containment. Usually these tanks are prefabricated with steel or fiberglass and have lower capacity than the vertical aboveground storage tanks. Cut and cover tanks are constructed of concrete and / or steel, and are of large volume and vertical design. These tanks are located mostly underground with a very small portion above the surrounding grade, and mounded over the earth. Cut and cover tanks are usually found at military air bases and wherever security against terrorism or sabotage is necessary.

Fig. 6 Aboveground tanks

Fig. 7 Underground tanks

In all cases, storage tanks must be provided with suitable secondary containment to capture any spills, leaks, or other unwanted product discharges. Storage tanks are equipped with ancillary devices dry and level Overfill alarms, low level alarms, automatic product level gauging, manual gauge ports, sampling ports, floating suctions, access man-ways, and vents.

Fuel distribution is accomplished through a system of supply pumps, filters, meters, pressure and flow control valves, and other equipment. These systems draw fuel from the storage tanks and are usually located adjacent to the tanks in the tank farm area. From there, jet fuel is usually distributed to the aircraft by way of a refueler truck or an underground hydrant piping system. Use of refueler trucks is a much slower process than a hydrant system, as the amount delivered is limited to the truck capacity, requiring several trips, it is usually the

only means of fuel delivery at these airports. It is, nonetheless, the most economical means of fuel delivery in terms of capital expenditure, and at many airports, sufficient to meet operational needs.

2 ENVIRONMENT, HUMAN HEALTH AND LIFE SECURITY

Safety data sheet according to the Regulation ES no. 1907/2006 (REACH) represents a set of the identification data on fuels and a summary of the data needed to protect life and health and the environment.

There are are first aid measures in the case of inhalation, skin contact, eye contact, ingestion and some general information in this Regulation.

The necessary fire prevention measures include fire extinguishers, special hazards arising from the substance or mixture and guidance for firefighters. These guidance includes protection during firefighting and other information related to the fire. The occurrence of large fires in areas with poor ventilation or closed objects requires fully equipped protective clothing with self-contained breathing apparatus covering the whole face in running overpressure.

The occurrence of accidental product leakage needs necessary emergency procedures and safety measures with using of the protective equipment.

Aviation fuel is required to comply with various safety precautions for safe handling and compliance with the conditions for safe storage, including any incompatibilities. When dealing with aviation fuel there is always a high risk of creating an explosive mixture of vapor and air. It is therefore necessary to secure the compliance with all relevant regulations relating to the hazardous environments and handling or storage of flammable products.

Waste treatment process is important in any society and has to be in accordance with the local regulations. Recycling, external recovery, treatment and disposal of waste should be comply with applicable national and / or local regulations. Discharge of material into sewerage is forbbiden.

3 INPUT COSTS FOR STORAGE FACILITY

The storage facility costs consists of two parts at the airport: the investment costs and operation costs. Investment costs for storage facility are disposable and are amortized over time. Operating costs are permanent and when taking into account the length of use of equipment and computes differences, these differences can be enormous. We can analyze these costs after the costs that are needed before Tax warehouse operation.

3.1 Tax warehouse operation

These are significant costs in terms of items. Information about Tax warehouse operating is administered by act number. 98/2004 statute about mineral oil excise duty. This act governs the taxation of mineral oils excise duty on the tax territory.

3.2 Investmnent and operating costs

Construction of the storage facility at the airport must undergo detailed planning. Poor planning can result in large financial losses. Part of the equipment shall be: land, paved access road to the storage facility, subject with operating rooms and technical premises, storage tanks, underground storage tanks emergency, parking lots and roofing tanks for storage of aviation fuel, paved areas, site fencing and CCTV, underground engineering networks (water connection, sewer connection, oily water sewer, transformer, oil separators, external LV cable networks, HV connection and area lighting) and refueler trucks (at least 2).

In the facility must be administrative, hygiene, storage and communication premises as well as facilities for the repair of automotive engineering and technology parts.

In the technological room is situated mechanical equipment part, ensuring filling and dispensing aviation fuel. There are also the pumps, piping, filters and measurement here. The aviation fuel samples are processing, evaluating and storing in the laboratories. The operating rooms have a computer set with the appropriate software, running the operation and management.

Within the investment costs there is the possibility of saving money related to the choice of the site. Plot size obviously depends on the aviation fuel demand at the airport, which means the bigger demand is, the bigger storage tanks is needed, resulting in a widening area. It is also necessary to analyze properly the size of storage tanks to avoid unnecessary investment costs for large storage tanks. The safety investment costs could be reduced by choice of: camera system (introduce yes/no, if yes, than correctly determining the number of cameras and cheaper system), communication equipment at the gate which is not necessary and gate motors.

Operating expenses of the storage device include: energy costs, vehicle operating costs and personnel costs.

During the operation, requirements arise also for thawing materials for winter maintenance of paved areas, asphalt mixtures for editing potholes and coatings for maintenance of steel structures. The costs of these items are very complicated to calculate.

4 PROPOSAL OF AVIATION FUEL STORAGE FACILITY AT INTERNATIONAL AIRPORT

This proposal aims to increase operability and boost overall profit within the business aviation fuels. Retail is a form of classical storage of aviation fuel at the

airport. This proposal is a wholesale form, where in retail the profit is 0,7 EUR per liter of fuel and in wholesale it is 0,12 EUR per liter.

The storage facility will consists of seven aboveground storage tanks, five of them have a volume of 5000 m^3 and two have volume of 500m^3. These 5000 m^3 tanks will be used for state material reserves, where the state will pay 2.68 EUR per liter/month and the other two for their own consumption. This project would cost a 120 millon EUR.

Entrepreneur is required to maintain emergency stocks (state material reserves) through the agency for the purpose of compliance with international commitments.

The agency ensures the maintenance of emergency stocks for the entrepreneur under agreement. Business terms and the price of the service for ensuring these stocks are published on the agency web site. Price for the service must be non-discriminatory. Price covers the costs of: acquisition, emergency supplies insurance, management of emergency stocks, interest and other financing and administrative agency costs.

Acquistion, storage, maintenance and release of emergency stocks and threshold emergency stocks are described in the act number 218/2013 statute about emergency stocks of oil and oil products and about solutions to a serious oil shortage and on amendments to certain acts.

CONCLUSION

Planning an aviation fueling system requires careful consideration of the many factors affecting the fueling process, as well as airport airside operations. Whether creating and fueling facility for a major international airport, a regional airport, or military aviation and installation, each presents a unique set of conditions that must be evaluated and addressed in planning, design, and implementation of the project. Factors to be considered include the type of aircraft to be serviced (hence, the type of fuel that will be dispensed), the volume of air traffic, and the associated costs. While cost may be a major decision driver, it must be balanced with due attention to safety, environmental issues, and the airport's requirements for on-going airside functions and the efficiency of the fueling process.

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