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ROLE OF BULK FUEL INSTALLATIONS (BFIS) AND FIELD PIPELINE SYSTEMS IN OPERATIONAL SUPPLY CHAIN

Abstract

Bulk Fuel Installations and Field Pipeline Systems (FPSs) can be considered as logistic installations for the purpose of fuel management in the operational area. Mobility, capability of force elements depends mainly on provision with fuel. Operation of Bulk Fuel Installations and Field Pipeline Systems in the area of operation based on utilization of Host Nation Support (HNS) capabilities and Contractor Support to Operations (CSO). In the article the author introduces the designation, main parts, capabilities and role of BFIs and FPSs in Operational Support Chain.

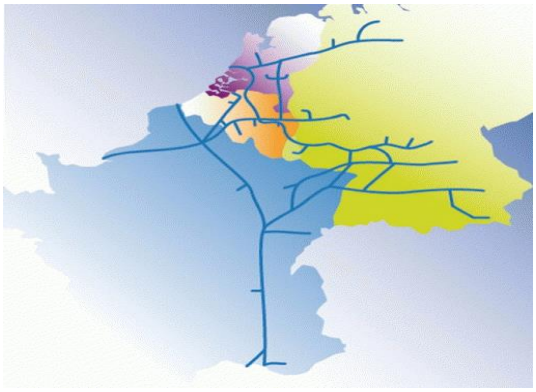
A folyékony üzemanyagok tárolására szolgáló létesítmények (Tábori üzemanyag raktárak) és tábori csővezeték rendszerek alapvető rendeltetése a műveleti területen tevékenykedő erők üzemanyaggal való ellátása. Az erők mobilitása, műveleti képessége nagyban függ a hatékony üzemanyag ellátástól. Az alkalmazott létesítmény működtetésének sikere a műveleti területen csak a Befogadó Nemzeti Támogatás képességeinek kihasználásával és a szerződéskötésen alapuló támogatás alkalmazásával érhető el. A szerző cikkében bemutatja a folyékony üzemanyagok tárolására szolgáló létesítmények és tábori csővezeték rendszerek alapvető rendeltetését, fő részeit, alkalmazási lehetőségeiket és a műveleti támogatási láncban betöltött szerepüket.

Keywords: *Bulk Fuel Installation, Field Pipeline System, Operational Support Chain ~ Tábori üzemanyag raktár, tábori csővezeték rendszerek, műveleti támogatási lánc*

INTRODUCTION

Application of pipeline systems can't be considered as a new supply method with fuel in military support chain. During the WWII1 Russians used a field pipeline to support citizens in Leningrad, that was surrounded by german troops. They managed to lie down the pipes under the ice of frozen lake Ladoga. Later on field mainline pipeline systems proved themselves as a primary method to support russian troops with fuel during the war in Afghanistan2. Member states situated in Central Europe also recognized the advantages of military pipeline systems.

The Central Europe Pipeline System (CEPS) is the largest cross-border multi-product petroleum pipeline system in NATO. The CEPS crosses the Host Nations of Belgium, France, Germany, Luxemburg and The Netherlands and is over 5,599 km long. With 33 depots, its storage capacity is over 1,250,000 m³. The NATO Central Europe Pipeline System (CEPS) Programme manages the operation, financing and maintenance of an integrated, cross-border fuel pipeline and storage system in support of NATO's operational military requirements during peacetime, crisis and conflicts, including expeditionary operations. The day-to-day pipeline operations and maintenance is executed by four National Organisations and their respective dispatching centers. The CEPS Programme member nations are Belgium, France, Germany, Luxemburg, the Netherlands, and the United States. The member nations with CEPS assets within their territory are called the Host Nations and comprise: Belgium, France, Germany, Luxemburg and the Netherlands.The CEPS Programme Office assures operational, technical, budgetary and administrative control of the CEPS in peace- and wartime in accordance with the Charter of the NATO Support Organisation. [1]



1. Figure. Scheme of NATO CEPS
(www.nspa.nato.int)

Application of military pipelines has many advantages and disadvantages. However, pipelines and hose lines have their limitations too.

Advantages

- Pipelines offer many advantages over other conventional means of transporting petroleum products. From an economic point of view, the pipeline is the least expensive transportation method in which to send large quantities of products over distances.
- Pipelines are all-terrain modes of transportation which allow access to areas that not suitable for other forms of transportation.
- Pipelines relieve the burden of fuel transportation from rail and road nets, which are more expensive and congestive. Bear in mind, approximately sixty percent of logistic

[1] Second World War
[2] Soviet-Afghan War, 1979-89.

tonnages is bulk petroleum. Using a tactical mainline pipeline system, we can deliver almost 2.5 million litres of fuel forward each and every day. This will free up approximately 250 military tankers (with the capacity of 10 cubic metres) to move forward to support the tactical fight.
- Pipelines offer extremely poor targets for enemy aircraft.
- Pipeline damage can be repaired much faster than damaged railroads or highways.
- Pipeline operations are not affected by adverse weather conditions.
- Pipeline use frees up large numbers of personnel and vehicles that can be used for other logistic activities.

Disadvantages

- Pipelines are subject to disruptions by sabotage and guerrilla attacks.
- Marine terminals, pump stations, and tank farm complexes are attractive targets for enemy air and missile attacks.
- Locating leaks and damage is time consuming.

Conventional warfare will use pipelines in much the same way as they were during WWII and the Soviet-Afghan War. Although equipment and technology change, the concept does not change. Employment, however, will require increased quantities of fuel and a pipeline system capable of quick deployment and emplacement.

DESIGNATION AND CONSTRUCTION OF BULK FUEL INSTALLATIONS

Bulk fuel installations are logistic installations for the purpose of fuel management. Bulk fuel installations can be categorized by means of their size and logistics support area as follows:

- *Forward BFI* with a storage capacity of up to 10 m³ for highly mobile and immediate fuel supply – in particular for Army Aviation units;
- *Battlefield BFI* forward BFI of the in-theatre forward logistic base with a storage capacity of up to 900 m³ for immediate fuel supply;
- *Main BFI* BFI of the in-theatre logistic base or on a deployed operating base (DOB) with a storage capacity > 500 m³.[2]

As a general rule, an in theatre logistic base BFI or a DOB BFI (Main BFI) will be filled by civilian or military road tank trucks, rail tank cars, inland vessels or seagoing ships according to the supply principle (i.e. the fuel will be delivered to the BFI) involving Host Nation Support or Contractor Support to Operatnios (HNS/CSO). Connection to another type of pipeline system (stationary or field-type) is possible.

BFI consists of the following technical equipment:

1. Field Pipeline Equipment (used by German Bundeswehr)
2. NATO Mobile Pipeline Repair Equipment (MPRE).

Field Pipeline Equipment is used to construct BFIs, to temporarily restore the working order and operability of damaged or destroyed installations, and it is used to set up stationary pipeline systems, fuel supply installations on airfields as well as further pipeline systems. It includes individual components, like pipes, fittings, pipe connectors, hose lines, volumetres, reduction valves, flow limiters, gate valves, fuel pumps with different flow capacities, filtering devices and flexible tanks.

The MPRE was procured using NATO funds and serves the purpose of temporarily repairing damage at NATO pipeline systems and erecting replacement installations. The equipment was provided to the respective host nations for the purpose of training and sustainment training and for usage at NATO pipeline systems. This equipment is used to

repair damage at the CEPS [3]and is generally not used for BFI construction or damage repair in national responsibility.

Pipes used for BFI are made of steel, have length of 4800 mm and a nominal diameter of 150 mm. For couplings of pipes steel shackles are used with rubber washer. Coupled pipelines must not rest on the ground. Couplings must be tensionless, accesible and visible for inpection. They must feature a drip pan underneath.

2. Figure. Coupling
(Photo made by the author)

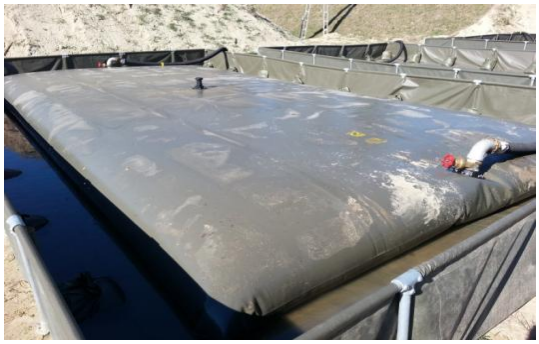
Fuel pumps for unloading have volume flow of up to 250m^3 cubic metres per hour, pumps for loading have volume flow of up to 150 m^3 per hour.

3. Figure. Fuel Pump for loading
(Photo made by the author)

Hose lines used for unloading and loading tankers, railway tankers, vessels and have connectors with multiple diameter. Volumetres (flow metres) are necessary for the registration of fuel handed over for endusers. Filtering devices are capable to clean fuel from contamination and water, the latter is extremely important for Jet fuel. It is equipped with differential manometer to measure the fuel pressure before and after the filter that let us know the time we have to change the filter cartridge.

Flexible tanks are used to store bulk fuel in it. It is made of synthetic rubber and has relatively big mechanical strength. Its material consists of three different layers which are connected to each other with glue. The outer layer is made of weather resistant synthetic rubber, the inner layer is resistant to chemical materials and there is a relatively thin but strong textile layer in the middle to provide mechanical strength. Flexible tanks have two connections for filling and a valve for evaporation.[3]

[3] See NATO Central Europian Pipeline System



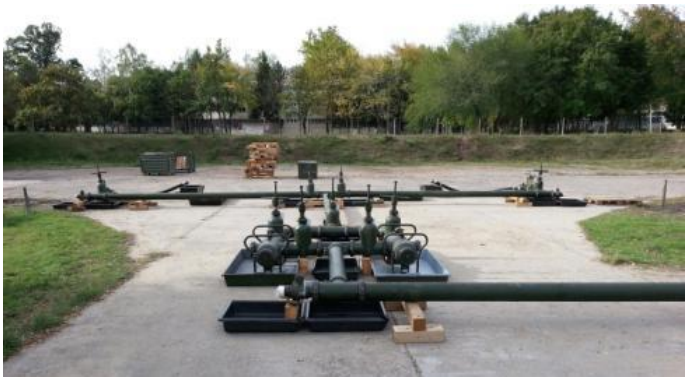
4. Figure. 50 m3 Flexible Tank in Dyke
(Photo made by the author)

FUNCTIONAL ELEMENTS OF BULK FUEL INSTALLATIONS

BFIs functionally can be divided into four parts.

1. Unloading station

Unloading station of BFI is designed to unload civilian or military tankers outside of the fuel depo. Depending on construction it is possible to download tankers in paralell using hose lines with the appropriate connection type. In this case the unloading suction pump will pump the unoaded fuel into the flexible tanks situated in tank farm.



5. Figure. Unloading Section with two ends
(Photo made by the author)

2. Main manifold

Main manifold is used for the control of fuel flow amongst the functional elements inside BFI. For the regulation of fuel flow the main manifold joins the pipeline sections that are connected to the functional elements and uses gate valves to control the direction of fuel flow.

6. Figure. Main Manifold of BFI
(Photo made by the author)

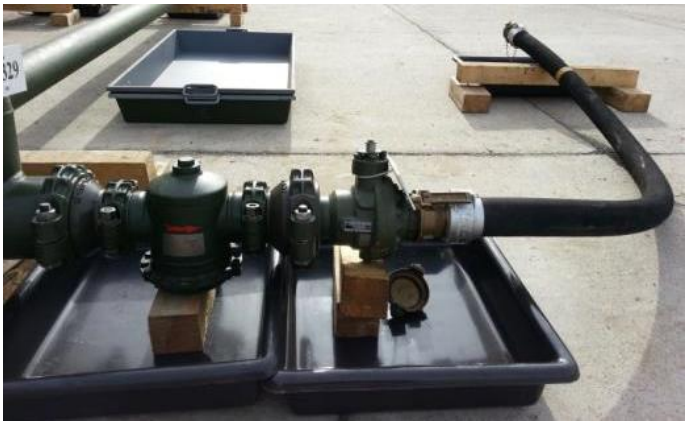
3. Tank Farm

Tank farm is designed to store ground fuel with the capacity of 150m^3 and aviation fuel with the capacity of 1200 m^3. The total capacity of BFI is 1350 m3. In ground fuel section there is a 38 m^3 flexible tank installed for safety purposes. Each flexible tank in tank farm has set up in his own dyke. Dykes are used in case of damage of flexible tanks, because the drained away fuel is easy to collect and won't contaminate the ground. Flexible tanks in ground fuel section and the aviation fuel section too are connected to each other thus the stored fuel can be pumped over from one tank to another.

7. Figure. Ground Fuel Section (150 m3)
(Photo made by the author)

4. Loading station

The loading station for aviation or ground fuels is used for filling up to two aircraft or road tankers simultaneously. The fuel is conveyed by the tank group pump through the main manifold to the tankers. When filling aircraft tankers with aviation fuels a filter with water separation unit shall be placed immediately upstream of the filling points in order to remove any remaining quantities of water from the fuel. Bearing in mind that tankers may be filled at a maximum rate of 60 m^3 per hour, a flow limiter (60 m^3 per hour) shall be installed in each filling point. In addition a volumeter (flow meter) shall be installed at each filling point to registrate the quantity of the handed over fuel.



8. Figure. Filling Point with Flow Limiter
(Photo made by the author)

CONCLUSION

Conventional warfare with large-scale military operations will be supplied with bulk fuel up to or near front lines. It is reasonable to expect that packaged fuels will be only used as a supplement to bulk supply methods when some forward areas are not accessible to bulk fuel transporters or in some cases, when rapidly advancing tactical situations dictate the need for additional fuels to exploit the situation. To some extent, some fuels may be packaged strategically and delivered directly into a combat theater to the end user. Regardless, throughput will be used as much as possible to bypass the levels of storage.

Beyond conventional warfare, application of field mainline pipeline systems are loosing their importance, while the Bulk Fuel Concept using BFIs in the oprational area is getting more important in the operation of support chains in many hot spots of the world.

References

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