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## Technical Bulletin

**Subject: BFI Dispense Pump Primer Units**

**Number: TB 2022-04**

**DIO Sponsor:** Andrew Parker

**Date of issue:** 15<sup>th</sup> September 2022

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**This Technical Bulletin is to be read by the following so appropriate action can be taken:**

- 1. DIO Service Manager (or equivalent for non FDIS contracts)**
- 2. DIO's Maintenance Management Organisations**
- 3. Others interested in the content of this Technical Bulletin might include:**  
Prime Contractors, Private Finance Initiatives, Public-Private Partnership and other traditionally procured contracts, Infrastructure Managers and Property Managers with responsibility for MOD projects and Property Management Works Services (including the legacy work of EWCs/WSMs), Health & Safety Advisors, Accommodation Managers and providers of Alternative Living Accommodation.

**When it takes effect:** Immediately

**When it is due to expire:** 12 months of publication

Health and Safety

This Technical Bulletin does not necessarily cover all aspects of the subject matter and readers should make themselves aware of other potential issues. Readers should also not rely on DIO publications as their only means of becoming aware of safety, operational or technical issues, but they should consult widely across other media to maintain awareness.

## **Aim**

1. To provide appropriate guidance for the attention of responsible persons regarding the operation and technical support of bulk fuel aviation dispense pumps used on the MoD Estate.

## **Introduction**

2. Compliance with the contents of this Technical Bulletin (TB) will enable compliance with the Health & Safety at Work etc Act 1974 and its subordinate Regulations.
3. The appropriate MOD officer shall arrange for the Operator and Maintainer as defined by JSP 317 to be made aware of the requirements of this TB.
4. Any work required as a result of this TB must be carried out in accordance with JSP 375, Part 2, Volume 3 – High Risk Activities on the Defence Estate.
5. On MOD establishments occupied by United States Visiting Forces (USVF), responsibility is jointly held by USVF and DIO(USF). At base level this jointly managed organisation is to take appropriate action to implement the contents of this TB.

## **Background**

6. Pumps primarily used in bulk fuel installations (BFI) on the MoD Estate to dispense aviation fuel were, depending on when they were installed, supplied by different original equipment manufacturers (OEM). Generally, the dispense pumps are located in a pump room that can be sited up to tens of metres from the BFI's tanks. Therefore, suction line pipework if not flooded with fuel may contain hundreds of litres of air (trapped in pockets at high and low points) that needs to be evacuated.
7. The type of centrifugal pump typically used in the BFIs cannot 'suck' air out of the suction line and, cavitation will often result when a pump is started and the suction line is not flooded. Repeatedly operating the pumps in this manner will cause the rapid impairment of the pump impeller. Furthermore, extended running times of >30s and/or carrying-out multiple restarts without the impeller submerged in fuel will result in irreversibly damaging the pump's mechanical seals
8. In order for this pump type to function correctly, the nett positive suction head 'available' (NPSHA) should exceed the pump's nett positive suction head 'required' (NPSHR). For aviation fuels, the applicable rule of thumb is for NPSHA to always exceed NPSHR by a margin of >1.0m. However, when there is insufficient NPSHA, mainly due to low tank levels, then pump-priming can be used to overcome that condition.
9. The use of pump-priming is well understood; however, its application on the Estate has met with varied success. A primer unit can either be a separate motor-driven device or be direct-driven by the dispense pump. Regarding the latter, the dispense pump needs to run whilst it is being primed; whereas with the separate primer unit, the dispense pump should not start until the suction line is completely flooded.
10. DIO TS were recently informed that mechanical seals were damaged and primer unit rotor vanes failed as a consequence of the extended time needed to prime some

dispense pumps. Such events ultimately resulted in the unavailability of the installation whilst the necessary repair works were carried out.

### Requirement

11. In order to determine the suitability of the pump-priming methods employed on the MoD Estate, the OAs with the help of the MMOs are required to complete the proforma at Appendix 1. On completion, DIO TS will better understand the subject matter and the scale of the reported issues and be able to provide technical advice and guidance on resolving ongoing pump-priming problems.
12. For information, see below for two images of the most commonly used examples of pump primer units on the MoD Estate:



Dispense pump with separate primer unit

Primer Unit



Dispense pump with direct-drive primer unit

13. The following guidance on completing the proforma (for each BFI) should enable OAs/MMOs to provide DIO TS with the necessary information:
  - a. *Self-explanatory.*
  - b. Enter the total number of dispense pumps installed in the BFI and identify those that are available for the OA's use.
  - c. Check the OEM's nameplate on the dispense pump for details of flow rate and discharge pressure at the duty point. If not available, refer to the OEM furnished technical file to find the information.
  - d. *Self-explanatory.*
  - e. Enter details of the events when a dispense pump has had to undergo major repair/overhaul in the last 3 years and why.
  - f. Check the OEM's nameplate on the pump for the NPSHR figure and/or refer to the OEM furnished technical file, the pump performance curve or datasheet.

- g. A separate primer unit will be motor-driven; whereas a direct-drive primer unit will have an arrangement connecting it to the pump driveshaft. See images at para 12.
  - h. This is the approximate distance the fuel needs to travel from the furthest tank to reach a dispense pump and should be measured (estimated) from where the pipework exits the tank and connects to the pump's suction flange.
  - i. This is the major outer diameter (e.g. DN200, 8-inch, 200mm) of the longest pipework length (see 13.h) that extends for the majority of its length.
  - j. The Suction Lift is the height that the fuel needs to be raised in order to enter the dispense pump and, the maximum height should be measured using the lowest fuel level in the furthest tank as the datum.
  - k. Provide details of how long a primer unit has to run in order to completely flood the suction line and prime the pump and, how the OA knows that condition has been achieved.
  - l. For the worst case scenario, record how many times a primer needs to be started in order to completely flood the suction and prime the dispense pump.
  - m. When a pump experiences cavitation or trips on high vibration, identify what is the donor tank's typical volume.
  - n. *Self-explanatory.*
  - o. Provide additional relevant data that might help DIO TS better understand pump-priming issues.
14. In the particular case of RAF Brize Norton, DIO TS requires similar information to that requested above (sub-para 13.a-13.o) to be provided for the hydrant pumps.
15. Using the data fed back via the proforma and following the outcome of further work in resolving these issues, DIO TS will amend *Technical Standard - Petroleum 01 - Specialist Works on Petroleum Installations on MOD Property* to provide more complete guidance on the types of primer units that are to be used on the MoD Estate.

Appendices:

1. BFI Reporting Proforma.

## Appendix 1. BFI Reporting Proforma

Location:		
Operating Authority (OA):		
Maintenance Management Organisation (MMO):		
	Question	Response
a	BFI Number/ID?	
b	How many dispense pumps are installed and are all available for the OA's use?	
c	Are the dispense pumps of similar construction and what are their flow rates (m <sup>3</sup> /hr) and discharge pressures (barg) at their duty point?	
d	Is there an OEM produced Installation, Operation & Maintenance manual available for the dispense pumps?	
e	Have any of the dispense pumps have had to undergo major repair/overhaul in the last 3 years and why?	
f	What is the NPSHR figure for the dispense pumps at their duty point?	
g	Are the dispense pumps fitted with a separate, motor-driven primer unit or is a direct-drive primer unit fitted?	
h	What is the longest distance (approx.) the fuel travels from the furthest tank to reach a dispense pump?	
i	What is the maximum diameter of the longest pipework run (see above) for the majority of its length?	
j	What is the maximum height/depth difference (Suction Lift) between the furthest tank and the dispense pump?	
k	Does a primer unit need to run for >30 secs and how does the OA know that the suction line is flooded?	
l	Does a primer unit need to run for more than one start sequence? If 'yes' then typically for how many starts?	
m	When the dispense pumps cavitate or trip due to high vibration, what typically is the volume of fuel in the donor tank?	
n	What are the contact details of the MMO's Responsible Person?	
o	Are there any additional comments?	
<p>Notes.</p> <ol style="list-style-type: none"> <li>1. OEM = Original Equipment Manufacturer.</li> <li>2. NPSHR = Nett Positive Suction Head Required.</li> <li>3. Suction Lift = Maximum depth of the liquid to be pumped measured from below the horizontal centreline of the pump impeller.</li> </ol>		