

ACCELERATION THE AIRCRAFT REFUELING SPEED USING THE NEW CONDUCTIVE SEALING MATERIALS

Zavgorodnia S. A.

National Aviation University, Kyiv

Scientific supervisor – Dovhal A.G., PhD, Associate Professor

Introduction. The static electricity is the most crucial hazard of the big volumes of fuel transfer from one custody into another. So its research will be urgent either in civil aviation or in military aircraft operation [1].

Problem issue. The static charge is to be removed or at least prevented during any transfer processes of petroleum products including the aircraft fuels. Typical examples of accumulation are illustrated in Fig.1. Static fuel discharge can result an ignition [2].

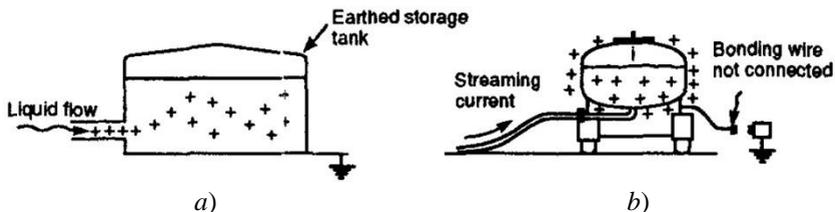


Fig. 1. Charge Accumulation on Low Conductivity Liquid in Storage Tank. (a) Charge Accumulation on an Insulated Conductor Rubber Wheels of Refueller (b).

So the rubber hose is an insulator, and it does not remove the static charge and even improves it during the fuel flow. The steel pipe can not be made as one integral section and requires elbows and curvatures to lead it in place precisely, thus the pipe to pipe bonding is necessary Fig. 2. Adjustable steel bar should have the sealings.

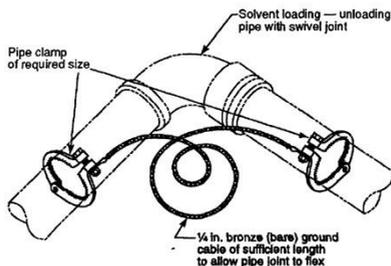


Fig. 2. Pipe Grounding Jumper for Movable Bars.

The swivel joints are made of non conductive materials, as well as all gaskets for sealing of easy splittable joints, so as the stuff sealing of metallic surfaces is impossible.

Research results. So in order to eliminate the static charge accumulation, the joints of pipes and hoses are to be sealed by conductive gaskets. So the conductive sealing materials of Unites States brand AV-DEC (Aviation Devices and Electronic Components) are selected for unified aircraft refuelling adapters. First of all the static resistance of seleted materials was tested. (Fig. 3). However some of them are to be conductive in order to remove the static charge (Fig. 3.) and some of them are to be insulators in order to block the static charge dissemination (Fig. 3).

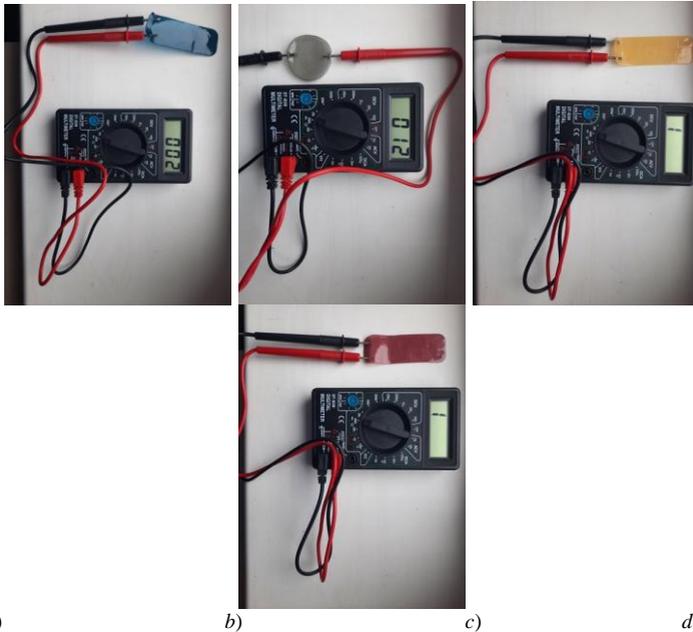


Fig. 3. Gaskets Materils Resistance Static Measure: *a* – HI-TAK Polyurethane Conductive Gasket standard antenna gasket material (AG XXXXXX-YY) US Patent No 6,530,577; *b* – HI-TAK Polyurethane Connector Gasket Material US Patent 6,530,577 (AD 2740X-YY-ZZ); *c* – HI-TAK TAPE MPN: HT3935-7FR flame retardent US Patent 6,530,577; *d* – HI-TAK Tape: HT3935-7 US Patent 6,530,577.

So the testing result are following in static (unloaded) state the conductive materials (fig. 3.) has the resistance 2 and 12 Ω respectively, and insulating materials has infinitively big resistance (fig. 3).

Summary. Static resistance check is preliminary to dynamic (loaded) resistance check modeling the gasket state in the aircraft refueling adapter. It will enable development the recommendations of gasket manufacture for this firm and it will be the subject of investigation of my future master thesis.

References:

1. Zavgorodnia S. A. Upgrading the aircraft refueling speed using the new conductive sealing materials. / " POLIT.Challenges of science today,. Тези доповідей XX міжнародної науково-практичної конференції молодих учених і студентів. 1-3 April 2020. - К .: 2020. - С. 36-37.

2. EN 12312-5:2005+A1:2009: Aircraft ground support equipment - Specific requirements – Part 5: Aircraft fuelling equipment. . – CEN: 2009, – 40 p.