

BASICS OF LAVATORY CARE

A Training Manual

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IMPORTANCE OF LAVATORY CARE

In a highly competitive commercial aircraft industry, good lavatory maintenance may well be one of the big factors in influencing a customer's choice of carrier.

Loss of odor control in an aircraft lavatory can be very offensive, particularly on long flights where the problem becomes more acute. In order to avoid this potential problem, lavatories must be clean, and toilet systems must be charged with an effective and long-lasting chemical deodorant.

For optimum results, it is necessary to have a lavatory care program that includes the use of chemical deodorants and cleaners that work together to achieve this objective. By following a good cleaning and deodorizing program, lavatory odor control can be extended so that less-frequent servicing is required.

AIRCRAFT TOILET SYSTEMS

Conventional aircraft toilets re-circulate the holding tank solution through flush rings around the stainless steel bowl by means of an electrical circulating pump. The newer type aircraft now have a vacuum-operated system, which sucks the waste along with about half a pint of potable water for flushing purposes into a common holding tank. As the customer never sees the holding tank solution, chemical deodorants do not have as important a role as they do in the more common re-circulating types.

Aircraft toilets are constructed primarily of stainless steel with the exception of the holding tanks, which are usually of a composite material.

SERVICING AIRCRAFT TOILET TANKS

The toilet holding tank may be a part of the individual toilet assembly or, as in larger aircraft, it may be separate, servicing several toilets. When serviced, the tanks are partially filled with a deodorant solution (concentrated product diluted with water) which is emptied and recharged at the next scheduled service stop. This is normally done with ground service trucks equipped with two tanks; one for picking up the waste material, and one for flushing and recharging the holding tanks with fresh solution. The waste is released to the sanitary sewer, and the deodorant tanks are recharged (re-filled) with fresh deodorant solution, usually at the same site in preparation for another service run. For liquid deodorants the service trucks can be charged with the proper concentration of deodorant, either by hand measurement or by metering into the fill water-line using a proportioning device, which can be done with a siphoning device or an electrical metering pump. Some service trucks carry the concentrated deodorant and meter it

directly into the aircraft. The service truck may also be charged with powdered deodorant, packaged in soluble packs or aluminum foil.

LAVATORY PRODUCTS

The products that are required for complete lavatory and toilet system care are:

- A toilet deodorant (liquid or powder) that will mask odor and color and control the growth of odor-forming bacteria (*refer to PT-162*)
- A cleaner that is capable of removing the odorous, gummy deposits that accumulate in holding tanks and deposit on the working parts of the toilet (*refer to Astromat Orange*)
- An acidic descaler that will remove the odor-retaining hard water scale deposits that severely interfere with toilet operations especially in vacuum-type toilets (*refer to AC-111C*)
- A complementary deodorizer, solid or liquid (*refer to Aerofresh A Plus Lav Spray and Deodorizing Cones*)
- A deodorizing surface cleaner for lavatory compartments and food preparation areas. (*refer to All-In-One or DLT-600 RTU*)
- A special cleaner for mirrors and stainless steel surfaces. (*refer to AWC*)

TOILET DEODORANTS

Loss of odor control in commercial aircraft toilets leaves a very negative and long-lasting impression on passengers. It is, therefore, absolutely essential to charge toilet holding tanks with an effective and long-lasting deodorant.

Traditionally, aircraft toilets have been treated with deodorant solutions composed of a perfume to mask odors, a blue dye to provide a pleasant appearance, a surfactant for product stability, and a biocide to inhibit the growth of odor-causing microorganisms. Additional ingredients, e.g., inhibitors and buffers, are also included in order to meet the pH, stability, and corrosion requirements of Aerospace Material Specifications (AMS), Boeing, and Douglas requirements.

Biocides: Previously, formaldehyde was the most widely used biocide. It was suited for use in chemical toilets since it is effective and economical to use. However, the U. S. Environmental Protection Agency (EPA) listed formaldehyde as a suspected carcinogen and thus turned the airlines away from the use of formaldehyde-based deodorants and increased the demand for safer alternative products.

Although there are a number of non-formaldehyde biocides available, quaternary-based products are the most widely used by airlines. Quaternary amine not only serves as a biocide in toilet deodorants, it also acts as a cationic surfactant whose positive charge is attracted to negative-charged bacteria. It is a biocide, wetting agent, and stabilizer, all in one. Another type of biocide that also kills viruses is Glutaraldehyde. Glute is made by Dow Chemical and is a powerful biocide used in hospitals to kill the toughest organisms. It is recognized by the US Center for Disease Control (CDC) and the World Health Organization (WHO) to kill various viruses of the 21st century such as Anthrax, Ebola

and HIV. Also, according to sources at the CDC, it is likely to be approved to kill SARS. Other types of biocides that have been used for odor control in chemical toilets are phenolic derivatives and hypochlorites (bleaches). For various reasons, these are not considered to be satisfactory for aircraft toilets.

Dyes: One of the most important components of toilet deodorants is the dye. AMS specifications require the presence of a blue dye in all aircraft deodorants. The function of the dye is to provide a more pleasant appearance, mask color that may develop in use, and to indicate the presence and operating level of the deodorant. In order to operate efficiently, a dye must be compatible with other components of the deodorant and waste material, be soluble under all use conditions, have color stability over a wide pH range and, most importantly, show little tendency to stain aircraft materials.

How Toilet Deodorants Function: The initial odor resulting from human waste is, for the most part, masked by the perfume present in the deodorant. If the odor level remained constant perfume would be all that would be required. Bacteria, which is always present in human waste, feeds on the organic material present and in the process, unfortunately, produces more volatile odor-causing by-products. As the process proceeds, the bacteria grow rapidly in number and the process continues to accelerate. The role of the biocide then is to kill the initial level of bacteria as quickly as possible and to prevent further growth for as long as possible.

How They Are Evaluated and Selected: The effectiveness of a toilet deodorant can vary with temperature, waste loading, concentration, and the equipment. All of these variables make it difficult to compare performance in the field. Air Canada has, therefore, developed a lab test that simulates what takes place in aircraft toilets in-flight under controlled conditions. The procedure is based upon evaluation of bacteria growth control. The tests are performed by making progressive additions of synthetic sewage to a prime charge (0.5 to 1.0 oz per gal) of deodorant. The sewage is first inoculated with *Escherichia coli* (E. Coli), a common odor-causing bacteria. The bacteria are then counted at certain time intervals, up to 48 hours, and the comparative kill and/or growth rates determined.

Selecting the right deodorant is an important step, but once this is done, good operating procedures are essential to ensure continued satisfactory performance. There are three (3) distinct areas of operation that affect the overall performance of the deodorant:

1. Mixing and diluting procedures;
2. Cleaning and maintenance of the toilet holding tanks; and
3. Trouble-shooting when problems occur.

Diluting and Mixing Procedures: Individual lavatory holding tanks are charged with a solution of deodorant diluted to the desired strength. The normal amount is four (4) gallons of diluted solution for each tank. Some of the large aircraft have larger holding tanks, serving more than one toilet, and require a larger charge. The holding tanks are drained, flushed, and refilled with deodorant solution through ports in the belly of the aircraft, using hoses leading to and from service trucks. The trucks usually have a number

of compartments. The largest one is used to collect the waste; the other compartments contain fresh water and/or pre-diluted deodorant. The deodorant is diluted in several different ways:

- A measured amount of deodorant is added to the charge tank on the service truck. The tank is then filled with clear water.
- An in-line proportioner is attached to the clear water line on the service truck. Examples of two types of proportioning devices used to measure the right amount of deodorant into the water are: 1) a small diaphragm pump which injects the proper amount of deodorant into the water stream; and 2) a siphon device that sucks up a proportionate amount of deodorant and mixes it with the stream of water passing through it.
- A small tank of deodorant is located on the service truck and a proportioning pump is used to mix the deodorant with water as it is being pumped into the holding tank.
- Service trucks and toilets may also be charged with a powdered deodorant, packaged in measured soluble or aluminum foil packs. This procedure has the advantage of eliminating drum disposal and metering devices.

Service truck activities are very critical in obtaining the proper odor control in aircraft toilet systems. It is, therefore, essential that routine maintenance and calibration procedures be established and enforced.

Each proportioning device should be checked for proper operation each day. This can usually be done by making a visual check of the color intensity of the charge solution. If the service truck crews are properly trained and they understand the importance of their job, most customer complaints can be eliminated.

CLEANING AND MAINTENANCE OF TOILET SYSTEMS

Periodic cleaning of the toilet holding tanks, flush rings, pump screens, and flapper valves is just as important as choosing a good deodorant.

Unpleasant odor in the lavatories can be caused by scale and sludge buildup, which traps and holds waste matter. Since this often occurs above the surface of the liquid, it is not continually exposed to the deodorant solution and the odor-causing germs are not being controlled. Also, the scale and sludge formations often block the holes in the flush rings, causing poor flow patterns from the rings.

When the scale and sludge buildup becomes an odor and flushing problem, the holding tanks and flush rings must be cleaned to eliminate odors and restore proper operation. This can be done by removing the toilet tanks from the aircraft for cleaning in the shop. However, except in extreme cases, the tanks and rings can also be cleaned in-place with a cleaner especially formulated for in-place cleaning¹.

¹ *Usual procedure:* Completely fill the holding tanks with concentrated cleaner to a level just over the flapper valve and allow to dwell overnight; flush repeatedly during the dwell period to keep the cleaner in contact with the flush rings; and drain holding tanks and thoroughly flush system with clear water and recharge with fresh deodorant solution.

Once the toilet tanks and flush rings have been cleaned, a maintenance program needs to be established to ensure that scale and sludge are not allowed to accumulate in the system. A good maintenance practice is to repeat the in-place cleaning procedure at scheduled, overnight stops, using diluted cleaner at ten percent (10%) volume.

The quaternary amines used in toilet deodorants are relatively active as cationic surfactants and, as such, they react with anionic cleaning agents, which are often contained in heavy-duty cleaners used around aircraft. If these cleaners are used to clean the toilet tanks and are not completely removed, the reaction can deactivate the deodorant, as well as cause possible formation of sludge in the holding tanks. Because of this reaction, care should be taken to ensure that only cleaners compatible with quaternary amine-based deodorants are used for cleaning toilet tanks.

TROUBLE-SHOOTING

The most often heard complaints are, "The toilet and lavatory have a bad odor," and "The color of the flush solution is not blue enough." These complaints are quite often interrelated. Lack of color, or an off-color, can be caused by a low deodorant concentration or by a contaminant, such as coffee dumped into the toilet. Bad odor can be caused by a mechanical malfunction of the toilet, low deodorant concentration, or soil and scale buildup in the toilet. It is also possible that the approved toilet deodorant is not being used, or toilets were not serviced on the previous stop.

SAFE HANDLING OF DEODORANTS

Remember, aircraft toilet deodorants only control the growth of odor-causing bacteria. They do not affect a one hundred percent (100 %) kill of all the harmful bacteria that may be found in human waste. Therefore, protective clothing, e.g., gloves and goggles, should be worn when handling the transfer of waste material from toilet systems.

SUMMARY

Most of the trouble encountered with aircraft toilets is traceable to one or a combination of the following problems:

- Mechanical malfunction of the toilet brought on by flushing pump failure, or plugging, due to soil or scale buildup
- Insufficient deodorant;
- Contamination of the deodorant solution with incompatible materials; and.
- Toilet system is heavily contaminated with odor-retaining soils and scale.