ACADEMY

AIRBUS CORPORATE ANSWER TO DISSEMINATE ENVIRONMENTAL MANAGEMENT SYSTEM

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Minimising environmental impact in Aircraft maintenance operations

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You can also find the ACADEMY Guidelines on www.airbus.com

I. Introduction

When evaluating the overall environmental impact of a product throughout its life cycle, careful consideration shall be given to the duration of the life cycle as well as to each of the life cycle phases.

The relative importance of the impact of each life cycle phase may in fact be significantly different for a short life cycle product compared to a long life cycle product (see figure 1).

For a long life cycle product, it is obvious that the impact of in-service use as well as maintenance of the product will be of significant importance.

For example, a lack of maintenance for a vehicle or a machine may lead to a significant increase in the consumption of fuel or other consumables required for proper timing.

Particular attention shall therefore also be paid to educating consumers or users to ensure the product is operated in the most appropriate and environmentally friendly condition, and in particular to ensure it is in line with applicable standards or regulations and in accordance with the initial characteristic of the product as delivered.

Figure 1: Relative importance of life cycle phases on the overall environmental performance of a product.

	Procurement	Design	Manufacturing	Use Consumption	Maintenance	End of life
Short life cycle	***	***	***	***	**	*
Long life cycle	***	***	*	***	**	*

* Not very important ** Important *** Very important

II. Limitation of Environmental impact in maintenance operations

2.1 Evaluation of Environmental aspects in maintenance (Step 1 & 2)

To limit environmental impact operations during the consumption/use phase of the product, it is essential for the various environmental aspects of the products to be identified as a prerequisite. This can be done according to the methodology defined in the Environmental Analysis Guideline or any other appropriate input/output box method. This analysis shall also identify which of the various regulatory frameworks should be applied when maintaining a product, as well as other commitments or company policies to be complied with (see figures 2 and 3).

The result of this streamlined analysis shall be improved knowledge and identification of the significant environmental impacts related to maintenance operations.

2.2 Definition of appropriate actions to limit significant environmental aspects / impacts (Step 2)

Appropriate limitation of environmental aspects in maintenance operations shall be performed in several ways:

- Through the DfE (Design for Environment process) and by considering the life cycle at the earliest stage in design (see DfE guideline). Appropriate check lists shall generally be useful to ensure efficient and effective limitation of the environmental impact through appropriate control of emissions and/or exposures
- Through appropriate training and education of maintenance operators and users or consumers

In this case, proper documentation as well as operator qualification and user/consumer awareness will be fundamental. This shall also include careful selection of external services with respect to environmental requirements.

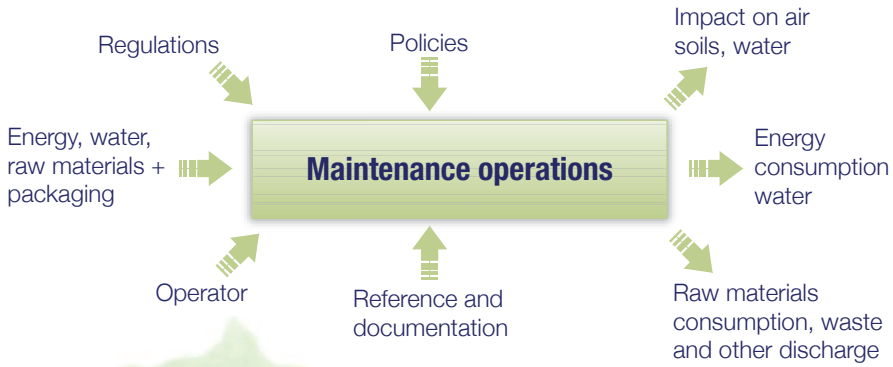

Figure 2: Maintenance Operations Input/Ouput

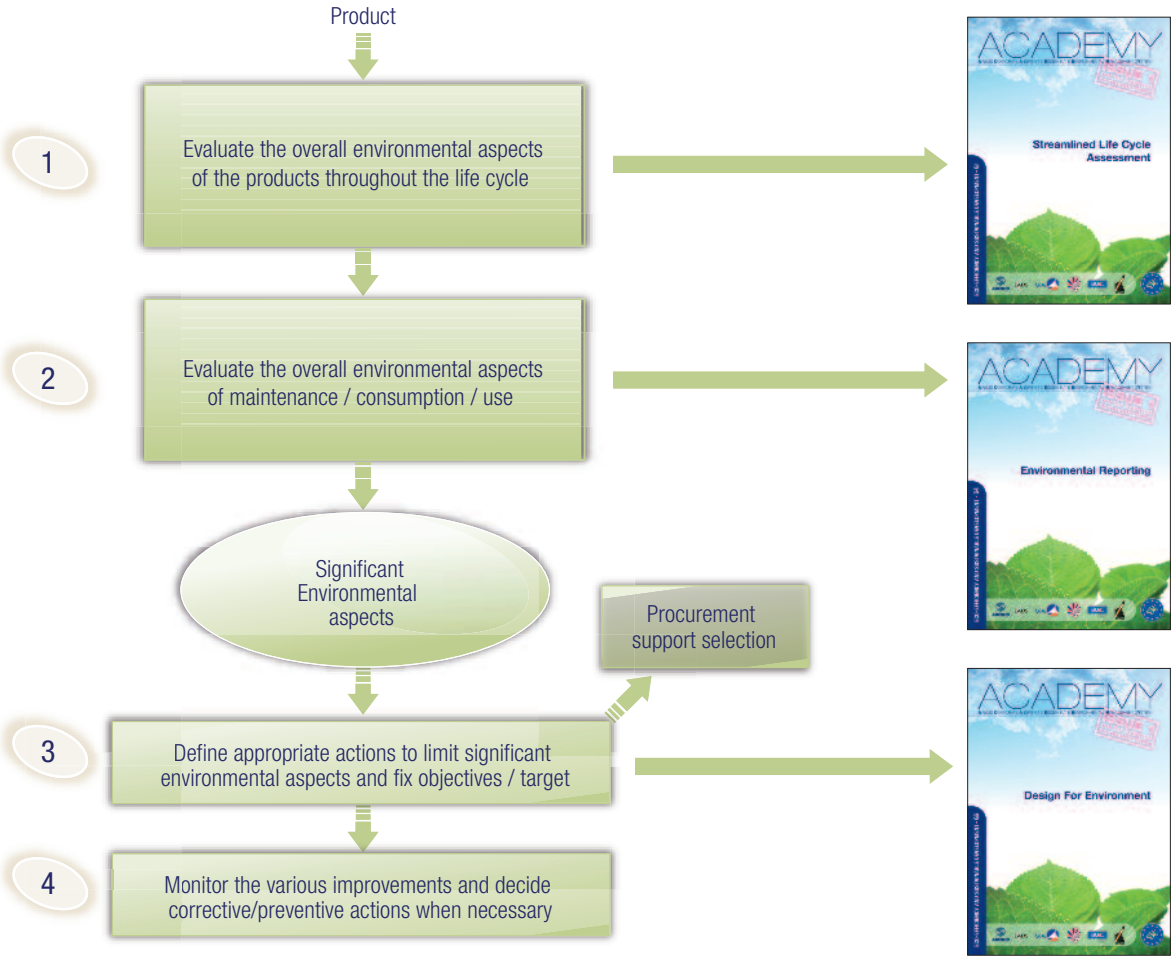

Figure 3: Flow chart to improve environmental performances in the maintenance or consumption phase.

Appropriate objectives and targets shall be defined in the context of a life-cycle oriented Environmental Management System. Associated action shall be identified and conducted through an Environmental Management Programme for Maintenance operations, as relevant.

2.3 Control and monitoring

The efficiency of the actions set up to limit overall environmental impacts in maintenance operations shall be regularly reviewed. Any deviations shall be monitored and corrected through corrective or preventive measures.

III. Examples of relevant actions to be possibly performed in maintenance, repair and overhaul operations in the aviation and transportation sector

The first main step is to respect the maintenance procedure then after we can limit properly the impact.

This section is not fully exhaustive but provides examples of actions to be performed to limit the environmental impact in the transportation sector.

a	Identify all operations demanding energy, water or other resources, and the relevant requirements (environmental analysis)
b	Identify all applicable regulatory frameworks to be complied with where the operations are performed
c	Identify all consumables used and the relevant Hazards. Collect all MSDS (Material Safety Data Sheet) and data and have them available
d	Select consumables to be recommended for maintenance operations with respect to environmental and health / safety Hazards
e	Provide appropriate training for users when necessary
f	Ensure regular checks are made with respect to the initial performance of the products and proceed with appropriate repair, if necessary
g	Identify any materials required to limit spillages, leaks, emissions, etc. and the corresponding damage to the environment, and keep these materials available for this purpose, particularly in abnormal situations
h	Select operators (including external services) on the basis of environmental requirements and give them appropriate training and inform them that the protection equipment is specified on the MSDS

Case study 1

Hazardous waste management and emissions in aviation maintenance

Hazardous waste as well as other emissions and discharge can be generated from quite a wide range of aircraft maintenance and overhaul activities such as:

- Cleaning
- Corrosion control
- Refuelling
- Decision-making
- Ground handling
- Catering
- Stripping and repainting
- Surface treatment
- Hydraulic fluids
- Cutting fluids
- Remark and repair

Many of these operations are fairly identical to those in new construction operations but are generally performed on a smaller scale. Careful attention shall be paid when performing these operations to strictly comply with applicable EHS regulations and other quality frameworks and practices recommended by authorities and manufacturers.

Case study 2

Solvent cleaning and degreasing operations on aircraft or vehicles

Aircraft cleaning and other degreasing operations are generally performed prior to carrying out various types of activities such as surface preparation or coating or supplies for equipment or parts cleaning.

This cleaning operation may generate a wide range of air pollution as well as waste that shall be minimised and managed appropriately. Importance shall be given when selecting a cleaning process to eliminate, as far as possible, the most hazardous chemicals such as for examples:

- Aromatic hydrocarbons (xylene)
- Methyl ethyl ketone (MEK)
- Some chlorinated solvents (such as chloroethylene, methylene chloride…), and all the substances considered as SVHC against the new REACH regulation

Solvents may cause some important hazards such as flammability or neurotoxicity and may contribute either to ozone depletion or to generating smogs (when they have a photochemical ozone potential).

Cleaning agents containing solvents shall be eliminated by using aqueous based chemicals or other advanced processes such as supercritic CO_2.

Degreasing stage

Case study 3

Hydraulic fluids

Hydraulic fluids are used to allow parts to move. They act as a lubricating medium that reduces friction, erosion and heat.

For common aviation, hydraulic fluids are generally phosphate ester based fluids.

Spillage and other leaks of hydraulic fluids as well as mist can lead to significant environmental and health hazards. Phosphate ether fluids are fire resistant - Systems containing hydraulic fluids can be flushed using various solvents such as HCFC 141b (until end 2008) or other appropriate cleaning agents, and all residues shall be eliminated as hazardous waste using the various regulated ad-hoc channels.

Case study 4

Coating processes Stripping processes

Coating processes are capable of releasing a wide range of Hazardous pollutants due to the solvents (VOC) used and the variety of speciality chemicals. They lead to waste generation that shall be properly eliminated through appropriate authorized means.

In general, the overall amount of waste generated, including left over paint in containers, no longer usable paint, overspray, rags, etc. may be significantly reduced through the use of more environmentally friendly alternatives as well as good practices.

Until now, stripping often required the use of highly aggressive and toxic chemicals such as for example methylenechloride and phenol. Chromates are also removed through residues and waste.

New environmentally friendly stripping formulations are now being developed. These present a significantly lower toxic profile as well as a less hazardous air pollutant content.

Practical blasting can also be used for paint removal; in which case caution shall be paid to the operating procedures to ensure maximum safety for the workers.

Paint application and stripping generates hazardous waste composed of various residues, materials, solid paint sludge, but also masking tapes with residual paint, rags, paper towels,…which shall be eliminated through regulated authorized circuits.

Example of stripping process

VI. Glossary

VOC - Volatile Organic Compounds.

EHS - Environment Health and Safety.

HAPS - Hazardous Air Pollutants.

EMS - Environmental Management System.

SVHC - Substances of Very High Concerns.

This document aims to provide guidance to help implementing Environmental Management System.

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