

# AVIATION COMPONENT CLEANING AND DEGREASING

WE HELP YOU DO MORE



# ARE YOU MEETING THE RISING CLEANING CHALLENGES?

In the aviation industry, cleaning metal parts to precise standards is not only paramount to quality, but more importantly, safety. Remaining contaminations can affect subsequent processes and the long-term functioning of parts, and worse still, impact on reliability and safety.

Nowadays, the bar on parts cleaning is being set even higher. Material compatibility between cleaning agent and sensitive aircraft aluminum alloys (such as AL 2024 or AL 7075) poses a critical issue. At the same time, stringent health, safety and environmental (HS&E) policies are compelling companies to substitute hazardous substances (e.g. converting from N-Propyl bromide or trichloroethylene to safer alternatives).

As a whole, the industry is facing mounting pressure to reduce Volatile Organic Compound (VOCs) emissions, chemical consumption and carbon footprint while ensuring worker safety – all without compromising on cleaning quality, efficiency and performance.



## SEIZING THE MAXIMUM BENEFITS OF SOLVENT CLEANING

No matter your challenge, may it be achieving high precision cleaning results, replacing hazardous substances, or complying with your company's sustainability protocol, we can help you put in place a reliable solvent cleaning ecosystem based on robust testing, objective evaluation and informed consultation.

With the proper implementation of protective measures, risk awareness and staff training, our goal is to transform your parts cleaning into a competitive advantage and help you seize the maximum benefits from solvent cleaning – where risks are properly managed and kept to a minimum, employee welfare and safety is looked after, and sustainability and regulatory compliance are well demonstrated.

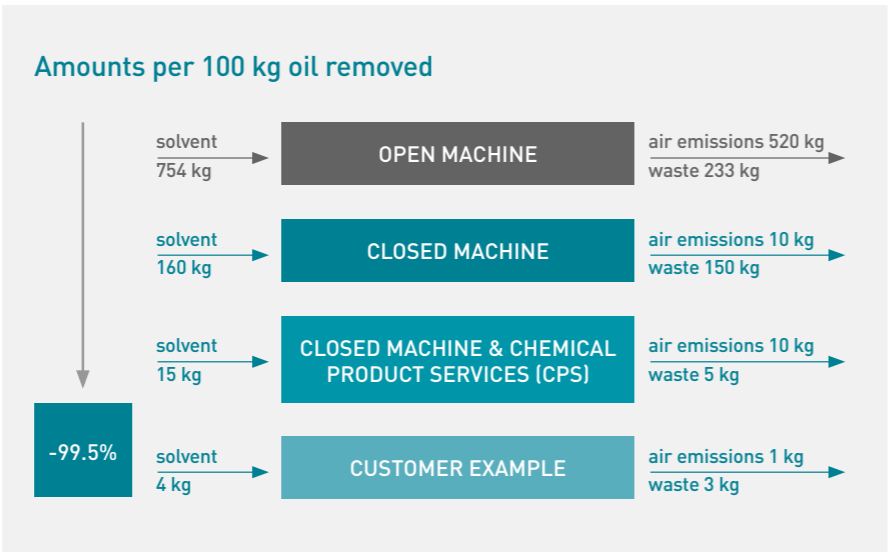
# PUTTING SUSTAINABILITY AT THE CORE OF CLEANING: VAPOR DEGREASING IN CLOSED CLEANING EQUIPMENT

In Germany, measurements<sup>2</sup> carried out by the Federal Institute for Occupational Safety and Health in 2014 confirmed that the emissions of closed cleaning machines<sup>3</sup> are so low that the occupational exposure limits (OEL) of 7.5ppm (lowest in the EU set by Hungary) is not exceeded.

Long proven for their superior cleaning quality, solvents are in fact extremely well placed to fulfill the evolving industry demands. They have good drying behavior and can penetrate easily into tight spaces. On the other hand, such properties can also bring inherent risks such as air emissions or ground penetration.

However, when used in modern closed (vacuum type) vapor degreasing equipment, the safe and sustainable use of solvents is enabled where solvent emissions are virtually eliminated. The use of a closed loop solvent delivery system can further facilitate an emission-free and spill-free transport, storage and handling of solvents. In addition, built-in distillation in closed cleaning machines can recover and purify used solvent, thereby significantly reducing solvent consumption and waste while lowering overall cleaning costs.

Figures from the European Union<sup>1</sup> show that the most modern solvent systems with up-to-date solvent management practices can remove 100 kg of oil using less than 15 kg of solvent (Process optimization can bring down solvent consumption further still). As a comparison, to clean off 100 kg of oil, approx. 100 kg of water-based cleaner is consumed in a water-based system.



Because of the simplicity and effectiveness of vapor degreasing, not only is it a benchmark in surface cleaning in aviation, it is also widely adopted in many other high-value, high-quality manufacturing sectors, including defense, space, medical technology, precision engineering, electronics, and motor vehicles.

1. Chemical product services in the European Union, European Commission, January 2006  
 2. Exposition von Beschäftigten gegenüber Lösemitteln bei der Metallreinigung. Handlungsanleitung zur guten Arbeitspraxis, Kassel: Regierungspräsidium, Kassel 2014  
 3. Closed cleaning machines that are compliant with the new 2nd Statutory Ordinance pursuant to the German Emission Control Act



**BE RESPONSIBLE – WE HELP YOU DO MORE**

In aviation degreasing applications, achieving the trifecta of excellent cleaning, sustainability and safety is the ultimate goal. Our complementary service offerings help companies go beyond merely obtaining the desirable cleaning results, but also satisfying their ecological, safety and regulatory requirements.

Acting responsibly starts with the choice of the right cleaning chemistry and responsible solvent handling, all the way to optimization of cleaning performance, waste take-back and risk awareness training. Our portfolio helps reinforce the safe and sustainable use of solvents every step of the way.

## VIRGIN-GRADE SOLVENTS THAT MEET EVEN YOUR MOST DEMANDING TECHNICAL REQUIREMENTS

A distinct advantage of solvents is their universal compatibility with metals. This means different metal types can be cleaned in one machine simultaneously.

Our high-quality solvent range is entrusted and approved by renowned Original Equipment Manufacturers (OEMs) around the world including: Rolls-Royce, Airbus, Boeing, Bombardier, SAFRAN, Collins Aero, Honeywell, GE Aircraft, and Leonardo, among others.

## CHLORINATED SOLVENTS – YOUR BENCHMARK FOR VAPOR DEGREASING

DOWPER™ MC, our virgin-grade Perchloroethylene, is highly stabilized and contains a special additive, making it an effective cleaning agent for heavy-duty applications. An ideal solution for clean parts with low surface tension (making it easy to wet into and evaporate out of tight spaces), it has a wide range of approvals in the aviation industry.

- Its relatively high vapor temperature helps eliminate high-melting, oxidized or hardened grease and contaminants.
- It is highly stabilized against the potential reaction with light metals, including aluminum and titanium, formulated cutting oils and their additives, as well as water humidity, which helps ensure cleaning process stability.
- Because of its high stability, DOWPER™ MC is unaffected by boiling or distillation and can be effectively recycled via built-in distillation in closed machines. Its use makes a great example of the Circular Economy.
- Parts cleaned with DOWPER™ MC dry quickly and completely, saving you energy, time and costs.
- It is also non-flammable.
- DOWPER™ MC is registered for closed vapor degreasing in Europe under REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) and is NOT classed as a substance of very high concern (SVHC).



### STANDARDS

- ASTM D4376 – Standard Specification for Vapor-Degreasing Grade Perchloroethylene
- ASTM F-945-06 – Standard Test Method for Stress-Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials



SCAN TO CHECK OUT THE CASE STUDY WITH SAFRAN NACELLES  
[insights.safechem.com/SAFRAN\\_Nacelles\\_Case\\_Study](https://insights.safechem.com/SAFRAN_Nacelles_Case_Study)

## MODIFIED ALCOHOLS

### – PROVIDING YOU A SUSTAINABLE SOLUTION

Our virgin, high-performance modified alcohols of the DOWCLENETM\* 16 Series along with DUALENETM 1601 S have diversified chemical and physical properties that can satisfy your individual requirements.

- All grades have a low toxicity and are chemically highly stable to ensure a secured process.
- As non-halogenated solvents, they are not under further evaluation for neither REACH in Europe nor TSCA (The Toxic Substances Control Act) in the US.
- With both non-polar and polar properties, they can effectively remove oils and greases but also certain polar contaminations like cooling emulsions or solids (e.g. salt, particles, abrasives).
- Supported by the MAXISTABTM S-Series Stabilizers, our modified alcohols can ensure a much more stable, predictable and safer process even when cleaning highly chlorinated oils.

#### STANDARDS (DOWCLENETM\* 1601)

- ASTM F 483 - Standard Practice for Total Immersion Corrosion Test
- ASTM F 519 - Standard Test Method for Mechanical Hydrogen Embrittlement Evaluation
- ASTM F 945 - Standard Test Method for Stress-Corrosion of Titanium
- ASTM F 1110 - Standard Test Method for Sandwich Corrosion Test (compatible with sensitive alloys such as AL 2024 and AL 7075)
- ASTM F 1111 - Standard Test Method for Corrosion of Low-Embrittling Cadmium Plate
- ASTM F 2111 - Standard Practice for Measuring Intergranular Attack or End Grain Pitting on Metals

DOWCLENETM\* 1601 does not contain any declarable substances featured within the Aerospace Defence-Declarable Substance List compiled by the International Aerospace Environmental Group (IAEG).



SCAN TO CHECK OUT THE CASE STUDY  
WITH HS MARSTON  
[insights.safechem.com/HS\\_Marston\\_Case\\_Study](https://insights.safechem.com/HS_Marston_Case_Study)

## COMPARISON OF PROPERTIES OF DIFFERENT CLEANING AGENTS

	Boiling Point (°C)	Evaporation Energy (j/g)	Flash Point (°C)	Surface Tension (mN/m)	Density (g/ml)	KB-value	Solubility in water (%)	Viscosity (mPa·s)
Methylene Chloride	40	329	-	28.1	1.32	136	2	0.42
Trichloroethylene	87	241	-	31.6	1.46	129	0.1	0.58
Perchloroethylene	121	209	-	32.3	1.62	92	0.01	0.88
<b>DOWCLENETM* 1601 / DUALENETM 1601 S (Modified Alcohols)</b>	<b>170-175</b>	<b>280</b>	<b>63</b>	<b>26.1</b>	<b>0.88</b>	<b>1000 approx.</b>	<b>6.3</b>	<b>3.2</b>
Standard Hydrocarbon	175-195	280	59	24	0.78	<30	0.00001	1.2
Water	100	2260	-	72.8	1	-	-	1
N-Propyl bromide (nPB)	71	261	10 to none (depending on test method)	25.9	1.35	125	0.25	0.49
Fluorinated solvent trans-dce blend	45	220	-	20 approx.	1.25 approx.	124 (Between 10-14 if without T-DCE)	0.004-0.012	0.42
Trans - 1,2 Dichloroethylene	47	336	2	25	1.27	117	0.06	0.41

### DID YOU KNOW?

It is important to consider that in many cases, certain grades of fluorinated solvents such as hydrofluorocarbons (HFCs) and hydrofluoroethers (HFEs) contain blending with trans-1,2-dichloroethylene (trans-DCE) – an ingredient that is a chlorinated hydrocarbon – in order to achieve sufficient degreasing ability.

Fluorinated solvents, along with N-Propyl bromide, methylene chloride, trichloroethylene, and perchloroethylene are therefore halogenated solvents.

Modified alcohols and standard hydrocarbons do have a flash point, therefore they must be used in closed cleaning machines under vacuum. Nevertheless, even when handling non-flammable solvents, solvent cleaning in closed vapor degreasing machines is still strongly advisable because it ensures the highest standard of worker safety, environmental protection as well as sustainability in terms of reduced solvent consumption and minimized wastage.

## ENSURING SAFE AND RESPONSIBLE SOLVENT HANDLING WITH THE SAFE-TAINER™ SYSTEM



SCAN TO WATCH THE SAFE-TAINER™ SYSTEM VIDEO

[www.youtube.com/watch?v=ARpFmh7-x8](http://www.youtube.com/watch?v=ARpFmh7-x8)

Developed with Responsible Care® guidelines in mind, the SAFE-TAINER™ System is an active risk management measure for handling both chlorinated solvents and modified alcohols. Used in combination with closed cleaning equipment, the SAFE-TAINER™ System is considered to be the best available technology (BAT).

The closed-loop solvent delivery system ensures the safe supply of fresh solvent and the safe return of used solvent. It can be easily connected to closed cleaning machines and allows safe and easy filling and emptying of the machine – with virtually no emission.

The SAFE-TAINER™ System helps companies meet their legal obligations to protect workers and the environment, from delivery, storage, filling and emptying the cleaning machine all the way to recycling.



All these services are in accordance with the National Aerospace and Defense Contractors Accreditation Program (NADCAP), ISO and other related standards regarding test methods, quality standards and the environment.

## OPTIMIZING YOUR CLEANING PERFORMANCE WITH INNOVATIVE SERVICE ELEMENTS

Achieving the required technical cleanliness is one thing, but doing so in the most efficient and resource friendly manner is quite another. With our easy-to-use test kits, stabilizers, and documentation tools, we help you optimize the cleaning process further still for enhanced efficiency and reliability.

With MAXICHECK™ Test Kits, you can easily monitor the solvent condition on-site and reliably determine the need and quantity needed for re-stabilization. Using MAXISTAB™ Stabilizers you can extend the solvent lifespan (thereby minimizing solvent usage), protect your cleaning equipment against acidification and corrosion, and increase overall process stability.

Once the solvent has reached the end of its lifecycle, our waste management services will take care of the recycling to recover any reusable solvents, helping you contribute to the Circular Economy.



## GROWING WITH THE INDUSTRY

SAFECEM is a proud liaison member of the International Aerospace Environmental Group (IAEG). We are proactive in supporting the work that the association carries out within the industry. IAEG delivers innovative voluntary solutions to benefit the global aerospace industry, its products and the environment.

## SOLVENT EXPERT KNOWLEDGE AT HAND WITH CHEMAWARE™

Our CHEMAWARE™ Knowledge Services equip you with expert knowledge so you can make the right industrial cleaning decision and ensure your solvent users act in a responsible manner. The service spectrum of CHEMAWARE™ covers trainings, lab services, consultancy and much more.

For example, our informative CHEMAWARE™ Solvent Training, helps ensure a safer workplace, a reliable cleaning operation and legal and environmental compliance. CHEMAWARE™ Lab Services offer routine analyses such as Solvent Analysis or Oil Compatibility Tests and complex troubleshooting.

## TURBOCHARGING YOUR SUSTAINABILITY EFFORTS WITH COMPLEASE™ CHEMICAL LEASING

With COMPLEASE™ Chemical Leasing, you do not buy solvents anymore.

Instead, you buy a customized performance package for a fixed monthly fee, which includes the supply of fresh solvent and the take-back of used solvent in the SAFE-TAINER™ System, service elements such as test kit and stabilizers, waste analysis, technical consultancy and solvent training, among others. You get more performance with less resources – with greater process reliability and simpler financial planning.



SCAN TO WATCH COMPLEASE™  
CHEMICAL LEASING VIDEO

[www.youtube.com/watch?v=Z2LwPVasgMA](https://www.youtube.com/watch?v=Z2LwPVasgMA)

# AIMING HIGH STRIKING A PERFECT BALANCE OF ECONOMY, ECOLOGY AND SOCIAL RESPONSIBILITY

Aviation manufacturers around the world entrust our high-quality solvents and service offerings to help them perform high precision parts cleaning for a wide range of applications, from airframe components and assemblies to heat exchangers all the way to aero engine controls and more.

AERO ENGINE CONTROLS

HEAT EXCHANGERS

LANDING GEAR

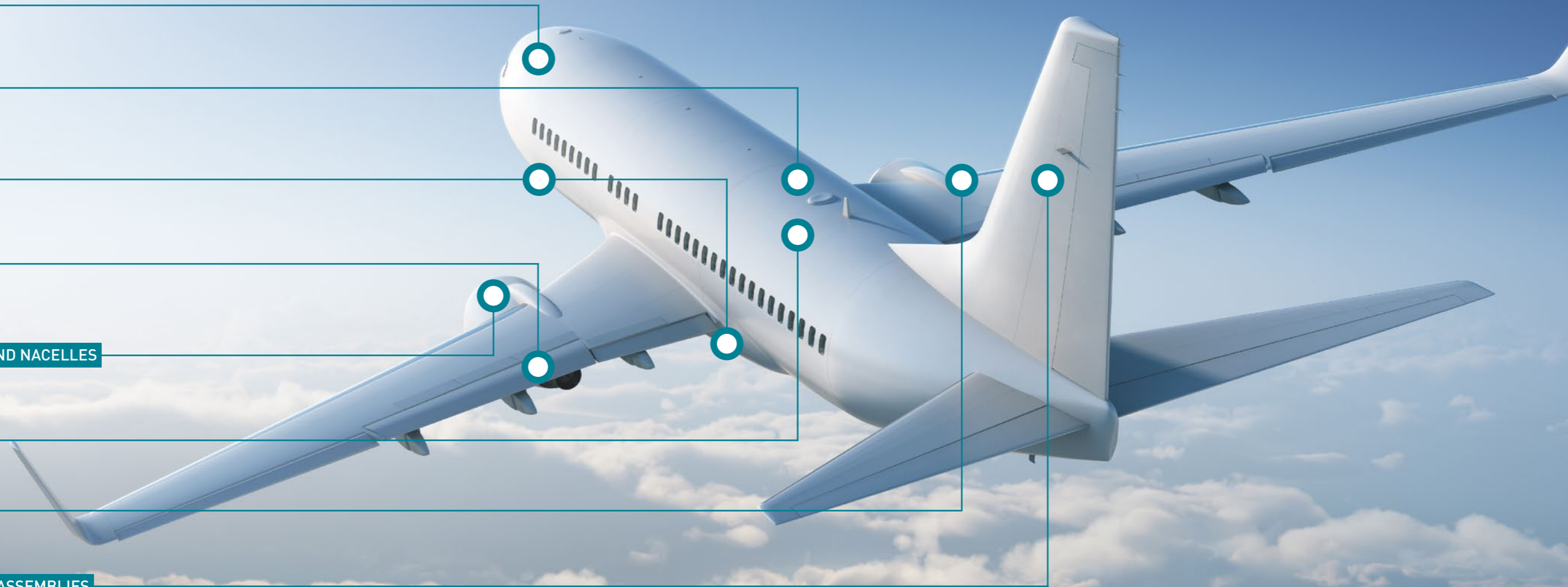
ACTUATION SYSTEMS

AERO ENGINE COMPONENTS AND NACELLES

FASTENERS

RIGID PIPE ASSEMBLIES

AIRFRAME COMPONENTS AND ASSEMBLIES



# WHY SHOULD YOU ENTRUST US TO HELP YOU ACT RESPONSIBLY?

Our roots trace back to 1992 where SAFECEM was founded with the sole aim of making the use of solvents safe and sustainable. Our foundation stone is therefore laid on solvent risk management. Born as a joint venture between a chemical producer and a chemical recycler, handling products in a closed loop has always been a natural part of our philosophy.

Now, some three decades later, our goal remains the same – to enable sustainable, safe and innovative use of chemicals to help you create long-lasting economic success.

For us, the Circular Economy is not just about recycling. It is about decoupling the outcome from the resource needed. That means helping you get better performance out of our products and to use the products for longer.

Leveraging our global alliance network, from leading cleaning equipment manufacturers, oil producers, waste managers to distributors and industry associations, we can offer you expertise and industry know-how through in-depth consultation, including initial assessment, planning, testing and review, to help you arrive at the right cleaning solution for your company.

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