

RESPA[®] & Q-CABAIR[™]
Precleaner + Filtration + Pressurisation
Technology for Enclosed Cabins & Enclosures



**CLEAN AIR
SOLUTIONS**

FOR CABINS, ENCLOSURES & ENGINES

| L | S | M |
TECHNOLOGIES

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As detailed in LSM Technologies recent technical white paper- [Breathing Easy- Airborne Particulate / Fibre Exposure of Enclosed Cabins of Mobile & Fixed Plant](#) statistics and reports have revealed that respirable disease and other debilitating health effects are on the rise due to workplace exposure to Airborne Particulate and Fibre. It is not only related to workers in open environments but also Operators in Enclosed Cabins of Fixed and Mobile Plant.

There is a common misconception that Enclosed Cabins of fixed and mobile plant provide protection against workers exposure to harmful airborne particulate and fibre. However, extensive studies have proven that in fact allowable PEL (personal exposure limits) inside a Cabin can be far in excess than the external operating environment.

RESPA® and **Q-CABAIR™** Technology is the **only** known **Cabin Pressuriser / Filtration Technology field tested and certified compliant** to current OH&S exposure limits.

Enclosed Cabins - the Issues!

Any operating environment (mining, earthmoving, ports, road construction, etc), that generates dust, exposes the occupants of Cabins to dangerous harmful airborne contaminants.

There is now an increased use of Stockpile Buildings for raw materials to reduce loss of product and to eliminate inundation of the public areas / housing, etc. Such “saturated” environments further increase risk of exposure, especially due to DPM (Diesel Particulate Matter) that is a Class I Carcinogen.

So there is a critical need to install certified and compliant Filtration / Pressuriser Technology, that is “fit- for- purpose” and will provide the highest protection for your human and equipment assets.

RESPA® and **Q-CABAIR™** Technology is the **only** known Cabin Pressuriser / Filtration Technology field tested and certified to be compliant by both Australian and International Regulator / Health Authorities.

What causes occupant exposure inside Cabins?

The reasons why inside a Cabin can become inundated with contamination are:

- Inadequate Filter Element arrestance and poor filtration efficiency allows contamination to enter the Cabin.
- Blocked External Filters can rupture and Panel Filter Elements lack adequate sealing. These Panel Filters lack the proper sealing and when the filter becomes loaded, contamination will enter around the frame.
- Blocked External Filters will reduce Cabin pressurisation and contaminants can be pushed / drawn into the Cabin.
- Most Recirculation Air Panel Filters suffer the same aspects as External Filter Elements, inadequately filtering contaminants as well as blocking quickly. Particulate and Fibre enters and is retained inside the Cabin from Opening of Doors (or windows), Operator clothing, boots, etc. The contamination is agitated and remains airborne by machine movement / HVAC fan.

Compliance Certification.

RESPA® and **Q-CABAIR™** Technology is the **only** known Cabin Pressuriser / Filtration Technology field tested and certified to be compliant by:

- **Australian OH&S Regulator:** QLD Mines Inspectorate
- **USA CDC / NIOSH:** (National Institute Occupational Safety and Health).
- **EN1822 DOP Tested:** to HEPA H13 / H14 class

See the full reports at this [link](#) and also description of [DOP EN1822 certification](#).

This certification means that one is assured that such technology is proven to provide the mitigation outcomes of workplace exposure to particulate and fibre under the [WHS Act / CoR Laws and as a PCBU](#). Suppliers of a mitigation safety engineering control are also deemed as a PCBU (Person Conducting a Business or Undertaking) and are also subject to WHS Act / CoR (Chain of Responsibility) laws and respective penalties.



Figure 1- Clean Air- for Operator + Machine + HVAC!

Essentials - Cabin Pressuriser / Filtration Systems

A Cabin Filtration / Pressuriser System should provide:

- Both the External and Recirculation Filter Element conformance to EN1822 HEPA H13 Media with efficiency of >99.95 % and removal of all particulate and fibre above >0.3 micron.
- Positive Cabin Pressurisation of >50 to 80 pascal at all times but ensure cabin pressure does not exceed 150- 200 pascal.
- Adequate flow / ventilation of the Cabin at 10- 15 l/s for each occupant inside the Cabin. A Cabin should not be “air- tight” otherwise there will be no flow of air from the Cabin to offset Co2 from occupants (s) respiration that will cause fatigue, drowsiness, lack of concentration and acidosis.

Precleaner + Self Cleaning Filter.

■ Other Cabin Precleaners + Filtration Systems:

There are a number of different Cabin Filtration / Pressurisers technologies (external air) in the market place consisting of:

- **Passive Precleaner:** is non- powered and relies on air draw / flow from the HVAC fan to provide Precleaning ejection. They are usually only 80% efficient on precleaning (used mainly for engines) and as the Filter loads, the precleaning function rapidly diminishes, air flow reduces and the Filter service life decreases dramatically. Also, debris is held within the housing choking the Filter media.
- **Active Precleaner:** is a unit with an electric DC motor and can be configured with (or without) a Precleaner. The Precleaner motor / fan is located **after** the Filter with the air flow **drawn** through the Filter, (units with Precleaners). However, once again, as the Filter loads the precleaning function rapidly diminishes and the Filter service life decreases dramatically. Also debris is held within the housing, choking the filter media- this is especially with Filtration Systems that do not have a Precleaner.

■ Q-CABAIR™ / RESPA® Precleaner / Filtration Technology:

The primary features of the Q-CABAIR™ and RESPA® Technology are:

- **RESPA® Precleaner:** The unique features of the RESPA® Patented powered technology is that it contains a Long Life (>30,000 hours) Brushless DC Motor. The patented Precleaner is located **before** the Filter Element and as such the precleaning efficiency (>99.5%) is maintained no matter how loaded the Filter Element becomes. Also debris is ejected continuously from the end of the Filter Cap.
- **RESPA® Self- cleaning Filter:** Due to the unique Filter Element media which is “surface filtration” (not depth filtration), the patented Vortex action of the Precleaner, air is forced consistently over the Filter Element surface and so debris is continually ejected from the Filter of the Housing.

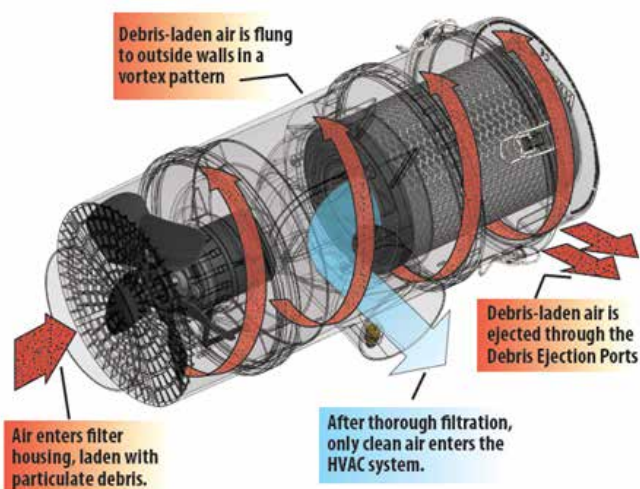


Figure 2- RESPA® CF Precleaner- How it Works

RESPA® and Q-CABAIR™ Technology- Configurations.

LSM has extensive experience and expertise to design and engineer the right Cabin Pressuriser Filtration System to ensure compliance with the ever- evolving / changing workplace exposure Standards to the highest of conformance levels.

Configurations are designed / supplied in either a Kit form or as complete systems, dependant on users primary expectations and outcomes.

■ RESPA® External Air Only.

The RESPA® CF2 is a powered unit, utilised to provide Precleaned and Filtered Fresh Air to the Cabin addressing the External Air supply.

The Cabin External Air Filter Panel is removed and the RESPA® CF2 Air flow ducted to the HVAC plenum to direct the air flow over the HVAC Evaporator.

The RESPA® CF2 airflow also provides optimum Cabin Pressurisation.



Figure 3- Cabin fitted with RESPA® CF2 External Air Unit

■ RESPA® External + Recirculation Air.

The RESPA® FFX2 is a non-powered unit to address Recirculation Air Filtration. It simply replaces the HVAC Panel Filter so as provide extended Filter service life

Entrapped Particulate / Fibre inside the Cabin can become airborne with machine agitation / movement, Operators clothes / boots, opening of doors, etc. Standard Panel Filters block very quickly and are non- compliant in their arresstance of filtering particulate / fibre.



Figure 4- RESPA® FFX2 Recirculation Filtration unit- replaces HVAC Panel Filter

■ Q-CABAIR™ External + Recirculation Air.

The Q-CABAIR™ uses both the RESPA® CF2 powered and the RESPA® CFX2 powered units- combined together.



Figure 5- Q-CABAIR™ - larger Cabins- multiple occupants- special applications

The Q-CABAIR™ enhances the air flow rates of both RESPA® units and provides for special applications where:

- There are larger Cabins- eg Fixed Plan Control Rooms.
- Multiple occupants working in the Cabin (higher CO² displacement required).
- Higher Cabin pressures are required (excessive leakage).
- An additional Chiller (evaporator) is required to pre- cool external air flow.

Protection of Assets / Cost Downs + Productivity.

RESPA® / Q-CABAIR™ Technology provides highest protection of your **Equipment** and **Human Assets**.

■ Human Assets:

- Highest Protection of Operator Health to HEPA H13 / H14 EN1822 compliance.
- Correct ventilation air flow to off- set CO² concentration (especially for multiple occupants).
- Increases Operator comfort and Concentration / Productivity.
- Optimum Cabin Pressure of 80- 150 pascal.
- Patented Powered Precleaner that can provide Filter service life of >1,000 hours.
- Highest Recirculation Air Filtration of entrapped contamination- to EN1822- >H13.

■ Equipment Assets- Productivity.

It is well known that one of the highest asset costs is maintaining HVAC System of Mobile / Fixed Cabins.

- Extends HVAC Service Life – no more blocked Evaporators.
- Extends service life and operation of Electrical / Electronic components.
- Less Downtime / Production loss.

Filter Element Technology.

Combined with a **Patented Precleaner** (>99.5% ejection) and **Self- cleaning filter** which delivers >1,000 hours service life, our Q-CABAIR™ and RESPA® Technology is available with a full range of unique Filter Elements including.

- **MERV16+**: optimum for Electrical Enclosures and Cabinets (no occupants).
- **HEPA >H13**: for maximum compliance to EN1822 for airborne particulate and fibre exposure.
- **ABEK1**: combined Activate Carbon and HEPA Filters for toxic / gaseous environments.
- **Odour**: Special HEPA Filter elements that remove offensive “odours”.
- All RESPA® Filter Elements are available in **Standard** and **Extended** Lengths to further extend replacement intervals.



Figure 6- 100% Sealing capability of the Filter Element is critical

Quality Cabin Environmentally Monitoring.

LSM Technologies has developed their own QCEM™ - **Quality Cabin Environmental Monitoring** unit that provides Operator In- cabin alarms / warnings and also integrates into our **FSM™ - Fleet Safety Tracking + Maintenance Management / Telemetry System**.

The QCEM™ Unit provide alarms / data for:

- Cabin Pressurisation- opening of doors / windows, filter service life and exchange durations, etc.
- Mass Concentration of Particulate- exposure inside the Cabin.
- Temperature and Humidity- thermal comfort for Operator / Air-conditioning failure, etc.
- CO² Concentration- avoid drowsiness / fatigue / acidosis.
- Air- conditioning Refrigeration Leakage.
- Toxic Gas Monitoring.



Figure 7- QCEM™ Unit

FSM™ Safety Management / Telemetry.

LSM Technologies **FSM™** is an in-house developed, designed and supported IP SaaS (software as a service) on-line technology.

LSM Technologies **FSM™** not only provides users with standard Fleet **Tracking** information via a **GPS / GSM / Satellite Telemetry Hub** mounted in the vehicle / asset but also an intuitive web browser interface with a single click access to **fleet dashboards, customisable reports, compliance tools** as well as **real time, user defined alerts**.

FSM™ online back-to-base management solution is scalable from a **single** vehicle / asset up to **thousands**. The system is a management tool that can be accessed via any internet connected PC or mobile device, including Apple iOS / Android mobile and tablet devices. It provides immediate alerts as required via SMS and email, anywhere in the **world- 24/7**.

LSM Technologies **FSM™** integrates to our unique product technologies for OH&S such as our:

- [Q- CABAIR™ / RESPA™ Cabin Pressuriser / Filtration Systems.](#)
- [Tyre Pressure / Temperature Monitoring.](#)
- [DFM \(Driver Fatigue Monitor\).](#)
- [CAS- Camera Viewing / Proximity Detection Systems.](#)
- [XLR Powered Engine Air intake Pre-cleaned / Pre- Filtration System.](#)

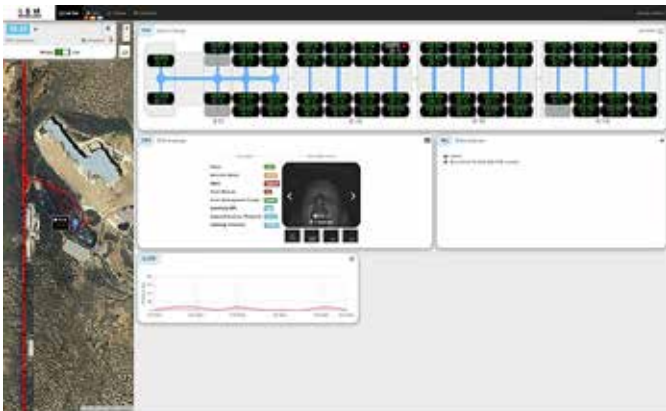


Figure 8- FSM - Fleet Safety tracking / Maintenance n-line System

OH&S Support / Back up.

LSM Technologies offers extensive services and support such as:

- Latest updates in OH&S Exposure Standards.
- Training and education.
- Engineering Design and Documentation.
- Site services, installation, commissioning, maintenance.

Training / Education / Simulator Cabin.

So as to obtain your own hands-on experience with our OH&S Technologies, LSM Technologies provides the following opportunities:

- **Simulator / Demo Cabin:** This is an Excavator Cabin that has a number of our Safety Control Technologies installed and interfaced with our **FSM™ System** which displays live functionality on attached touch screens.

Also our Demo / Simulator Cabin is fitted with Environmental Monitoring, CO² Sensors, Pressure Sensors, etc where we can display the effectiveness of our technology under real-time conditions using our Q-CABAIR™ and RESPA® System and Smoke Emitters.



Figure 9- Demonstration Cabin / Simulator

- **Education / Training:** We also have our own AV / Conference facilities for up to 20 people and so you and your colleagues are more than welcome to visit us, meet our Engineering Design Development Team for detailed discussions and / or technical presentations / Training of the technology solutions LSM Technologies has to offer.



LSM Technologies- Specialists Solution Providers

LSM Technologies offers their extensive experience, expertise, research and technical developments that provides ROI.

As an industry champion we are also committed to the on- going development of unique and specialised fit- for- purpose technologies and systems that continually improve our client's objectives of enhanced Safety (Health), Equipment Damage Control and Productivity that best protect your Human and Equipment Assets.

For further information please [contact us](#) or visit www.lsmtechnologies.com.au

