CLEAN ROOMS

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The old saying that a grain of sand jams the works takes on its full meaning in today's engines. Only the "grain of sand" is no bigger than a few microns. **In order to further increase the reliability and durability of its cars' essential components,** Renault detects and eliminates any impurities in controlled-environment clean rooms that are practically dust-free.

RENAULT COMMUNICATION

BASIC FACTS

Even though an impurity might look microscopic compared to the size of an engine, that is all it takes for an injection nozzle to malfunction or an oil film on a lubricated part to break – or, generally speaking, to impair an engine's reliability and durability. It is therefore crucial for Renault to verify that no harmful particle survives the multiples processes of machining and manufacturing. As part of its commitment to constantly seek ways of improving quality, Renault inspects parts made both on its own production lines and on those of its suppliers. Inspection involves checking for contaminants and residual particulate pollution.
To detect and measure the amount and size of impurities, two processes are used: one for fluids, one for powertrain parts

Fluids: A laser-beam meter counts particles in samples of fluids like coolants and lubricants, and depollutant solvents. Results are expressed in ISO measurements: number of particles > 5µm / number of particles > 15µm.

Powertrain: A decontaminating machine uses a solvent to clean all powertrain parts of particles. After the solvent has scoured the part in its entirety, it is filtered through a membrane. This method is useful for writing up the instructions for removing contaminants and cleaning parts. For new parts the aim is to determine the inspection and cleaning process: i.e. how the part should be oriented and gripped, the order in which a part's surfaces or internal circuits are cleaned, and the amount of solvent to use.

IN SHORT

CLEAN ROOMS ARE SPACES WITH CONTROLLED ENVIRONMENTS THAT ARE ALMOST TOTALLY FREE OF AIRBORNE CONTAMINANTS. THEY ARE GENERALLY INTENDED FOR THE ELECTRONICS INDUSTRY, PARTICULARLY THE PRODUCTION OF MICROPROCESSORS. RENAULT USES THEM TO DETECT AND REMOVE THE TINIEST CONTAMINANTS IN ORDER TO FURTHER IMPROVE THE QUALITY, RELIABILITY, AND LIFE SPAN OF ITS ENGINES.

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In the count phase collected contaminants are counted by a computer-aided automatic microscope. The particle count is performed according to particles' sizes, and the result is compared to parts specifications.
Regardless of the process used, it is crucial to be sure that impurities originate in the part itself and not in the devices used (contaminant extractor should be cleaned before testing), or in the facility where measurement was carried out.
It is for this reason that it is essential to cheque the origin of contaminants in a clean room, where the airborne particles and temperature are controlled. Even if the air in the clean room is not dust-free, the number and nature of the particles present are known data, They can therefore be distinguished from any contaminants on the part under analysis.

HOW DOES IT WORK?

The air in a clean room is constantly filtered and recycled. Similarly, it is kept at a slightly higher pressure than the air outside. Clean rooms have airlocked entrances for technicians and airlocks for the parts that are to be checked.
Thus no particle can find its way in.
Futhermore to avoid "polluting" a clean room, anyone entering it must wear a special suit, mob cap, shoes and gloves (no talcum powder).
No object likely to release fibres or particles like paper or pencils must be allowed into a clean room.

Clean rooms are categorized by class. Renault operates Class 100000 clean rooms.
A Class 100000 clean room is one that does not contain over 100,000 particles bigger than 0.5µm in diameter and less than 700 particules greater than 5µm per cubic foot. The electronics industry uses clean rooms where the air is kept at levels of even greater purity – often Class 10 clean rooms. The table below shows US FED classification which uses cubic feet. It is gradually being replaced by ISO standards which express volume in cubic meters.

CLASS	SIZE OF PARTICLES PER CUBIC METER					
	0,1 µm	0,2 µm	0,3 µm	0,5 µm	1 µm	5 µm
1	35	7	3	1	0	0
10	350	75	30	10	1	0
100	3 500	750	300	100	10	1
1 000				1 000	100	10
10 000				10 000	1 000	100
100 000				100 000	10 000	1 000

US FED	ISO
1	ISO 3
10	ISO 4
100	ISO 5
1 000	ISO 6
10 000	ISO 7
100 000	ISO 7

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