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INVESTIGATION OF CLEANING TECHNOLOGIES AND VALIDATION PROCEDURES
APPROPRIATE TO NEEDED CLEANLINESS FOR INSTRUMENTS USED IN THE SEARCH FOR
LIFE

Abstract

As a part of an ESA initiative to understand the cleaning process to achieve and control the needed cleanliness for instruments used in the search for life, this study (and related testing) investigated the working environment, the cleaning equipment and procedures needed to fulfil the requirements and the control means to ensure the cleanliness level, i.e. appropriate diagnostics with detection limits below the exobiology instrument requirements for the respective mission (approximately 1ng/cm²).

After an extensive research and a trade off of available cleaning technologies, Carbon Dioxide Snow cleaning was conducted on eight different types of spacecraft representative materials (and/or surface finishes) with representative levels of contamination for Particulate (PAR), Organic (VOC) and Biological (BIO).

The levels of cleanliness after cleaning were measured by means appropriate to the contamination (directly and indirectly). From this a procedure was developed that could be used during spacecraft AIV and a plan proposed for the qualification of any cleaning process that required indirect measurement of results.

Finally, a packing approach was developed based on techniques and materials from the semi-conductor industry. Using this approach long term storage samples were prepared and it is planned that the level of contamination on these samples will be measured after storage periods of 6 months, 12 months, 18 months and 2 years.