CROWN INDUSTRIAL SERVICES INC. **CLEANLINESS TESTING LABORATORY**

We test to ISO 16232 & VDA 19

Component Cleanliness Testing:
Fluid Extraction by Agitation

Fluid extraction is the most common method of removing contamination from various automotive components in accordance with cleanliness testing per specifications such as ISO 16232 and VDA 19, as well as many other OEMs (Original Equipment Manufacturers.) Furthermore, the process of pressure rinsing has been described as the "go to" method when applicable due to the ease and effectiveness when conducting the procedure. (See Methods of Extraction and Fluid Extraction by Pressure Rinsing for more detail.) Suppose a component has been presented for a cleanliness inspection where the internal surfaces are the only areas of concern and disassembly is not an option. Since an extraction by pressure rinsing can not adequately reach all areas of concern it is determined to be an inappropriate method. After further evaluation, it is decided a fluid extraction by agitation would be the most viable procedure due to the component's larger cavity and an opening that can be properly plugged or sealed.

Fluid extraction by agitation is described as administering an appropriate, compatible solvent to a component at 30-40% its internal volume, sealing all openings and agitating the component for a set period of time so the contaminants adhering to the internal surfaces are removed and suspended in the solvent. The seal is then removed from one opening and the solvent containing the contaminants is poured out so it can be filtered through an appropriate membrane for analysis. This process can either be conducted manually by a qualified inspector or via automated means. It is important to conduct an extraction validation to ensure the agitation parameters are sufficient in removing 90+% of the contamination from the component. Along with agitation time, other factors to take into consideration are amplitude (range or distance equating to a cycle) and frequency (number of cycles per unit of time.) It is important to note that VDA 19 and ISO 16232 do not recognize the agitation of small components in a container as an appropriate method of agitation, also known as a "gentle swirling/stirring" agitation, due to the high probability of the components contacting each other during the process creating unwanted debris. However, certain specifications like Continental's CTP-100260 specify this type of extraction as the required method.

Fluid extraction by agitation is suitable for components with larger internal cavities that can be accessed by an opening that also has the ability to be plugged or sealed. Large cavities are crucial when choosing this method of fluid extraction to ensure the force the solvent exerts on the component's internal surfaces is adequate in removing the contaminants. Tubes and hoses with narrow cavities are not ideal for agitation as the impulse created by the process is too weak to adequately remove contamination. In turn, this reserves agitation extraction for a much smaller array of components than

some of the other methods. Another drawback to agitation extractions is that manually conducting the procedure is ruled out with much larger components as the weight of both the component and solvent are far too excessive to lift or lift without the threat of serious injury. As a result, additional costs for purchasing and maintaining equipment to conduct automated agitation extractions must be taken into consideration.

Much like pressure rinsing, fluid extraction by agitation is a fairly simple process as long as liquid tight caps, seals, or plugs are provided for all openings and a non-foaming extraction fluid is chosen. Examples of foaming extraction fluids would be alkaline cleaners and pH neutral cleaners that contain surfactants or surface reactive agents that lower the surface tension between liquids and solids due to their amphiphilic nature (having both water soluble and water insoluble properties) which trap pockets of gas between a liquid and solid producing foam. Foaming is problematic in the agitation process in that it may spew from the seal upon opening resulting in loss of contamination as well as inhibit the extraction fluid from properly reaching the contaminated surfaces of the component with adequate force to effectively remove the contamination to be analyzed.

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Please feel free to give us a call – we do a lot of ISO 16232 based testing for a wide array of customers here at the Crown Cleanliness Testing Laboratory in Jackson, Michigan USA. Do not hesitate to contact us when you have a question about cleanliness testing or need cleanliness testing done. We offer Standard Turnaround for scheduled cyclical cleanliness testing and Expedited Turnaround when you need results ASAP. We also sell Lab kits and can train your personnel to do cleanliness testing if your customer insists you do the testing in-house.

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