Guidance for Technical Inspection of Twin Tube Shock Absorbers

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Abstract:*This article is focus on instruction which describes and shows the procedure that is to be used to determine the component cleanliness of new, unused twin tube dampers in the form of a volume production test. The long-term aim of each organizations is to create and sustain a standardized level of product cleanliness which could affect its functionality. Therefore, this regular check is very important.*

Keywords: *Inspection, Disassembly, Clean, Shock Absorbers*

INTRODUCTION

Principles of damping and suspension

When the vehicle drives over a bump, suspension springs and vibration dampers are compressed. There sulting shock to the vehicle will be absorbed by the suspension. The suspension prevents a contact between the sprung mass (body and payload) and the "unsprang" mass (axle and wheels). However, the springs strive to release the stored energy by relaxing themselves again. In order to quickly settle this recoilaction of vibration between axle and body, the chassis is equipped with shock dampers.

Nowadays it is very important to create and maintain a standard level of cleanliness shock absorbers. In this process, only the inner surfaces of the shock absorber are evaluated that come in contact with the shock absorber oil.

Equipment, which we need to control:

- Four stainless steel containers
- Tweezers
- Funnel
- Filter holder
- Red nylon rod
- Measuring cylinder

Fig. 1 Types of stainless steel containers

MATERIALS AND METHODS

General principles

The cleanliness test must be performed by specially trained staff in a separate room (as per VDA 19). This person must work in protective gloves. If any gloves have been damaged or only slight contamination, it is necessary to changed them.

The test room must be equipped with an air extraction system (workplace with air extractor).

Before the start of the inspection, it is necessary to ensure the highest level of cleanliness in the working place, filtration equipment, tweezers and all containers must be thoroughly cleaned (maximum 200 μm) and dried. The mentioned equipment must be subjected to a special cleaning process (rinsing with cold cleaner) prior to the cleanliness analysis. The washing liquid used must be prefiltered using a ≤1.2 μm filter.

The cleanliness of the containers used must be ensured through blank value testing that is performed analogous to the cleanliness tests (without parts).

Implementation

Firstly, we should determine the blank value**.** The blank value must be determined immediately before the component test. The procedure is the same as described in the following rows, without the parts.

Then we can start with the control. We continue with disassembly of the twin tube damper (Fig.2).

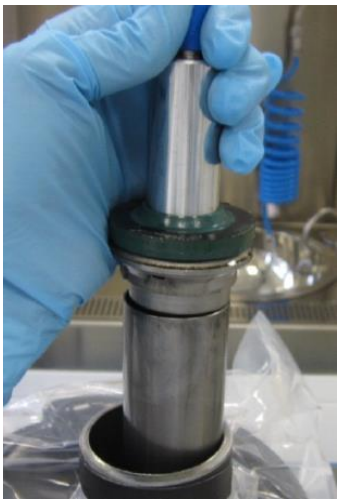

Fig. 2 Disassembly of the twin tube damper

Pull the piston rod out of the reservoir tube and place it in the stainless-steel container for components in an upright position (to prevent oil from leaking). Then loosen the guide with a light blow. Pull the guide upwards together with the seal and remove it from the piston rod. Separate guide and seal by lifting out the seal with the screwdriver (Fig.3). Discard the seal and analyze the guide only. The guide is put into the stainless-steel container together with the cylinder tube.

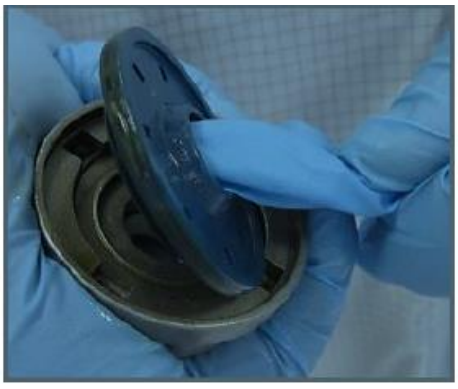

Fig. 3 Disassembly of components

Collect the oil from the inner and outer tube in the stainless-steel container for oil (Fig.4) and pull the piston rod out of the cylinder tube (Fig.5).

Fig. 4 The stainless-steel container for oil

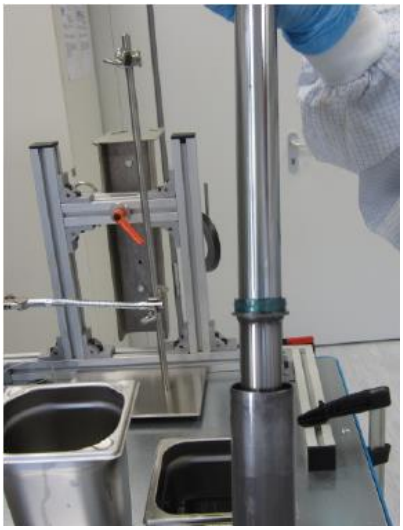

Fig. 5 Disassembly of the piston rod out of the cylinder tube

Then in the cylinder tube remaining oil is poured to the collected oil volume. Then measure the total quantity of the contained oil using a cylinder measuring cup (Fig.6) and pour it back into the stainless-steel container.

Fig. 6 Measuring cup

Next follows the extraction of each the testing components with cold cleaner into the stainless-steel container (Fig.7).

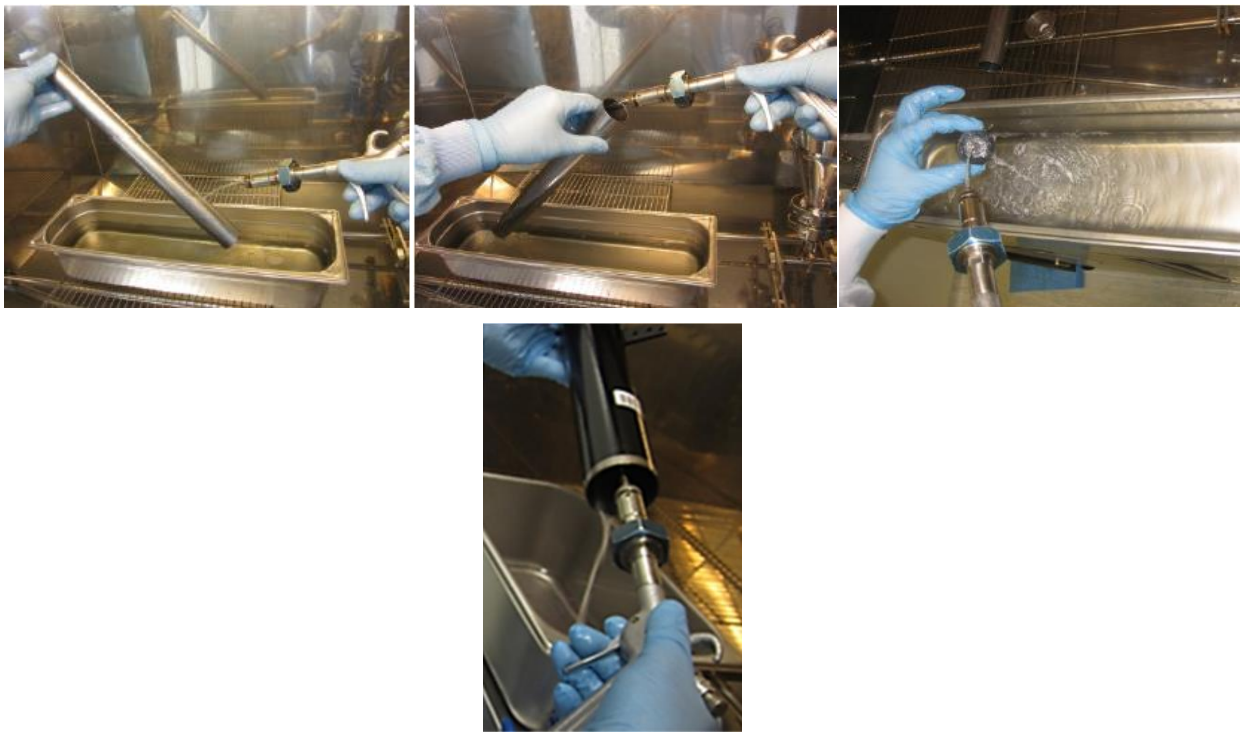

Fig. 7 Extraction of each the testing components

Spraying parameters:

− 1.5 mm nozzle
− 1 l/min flow rate
− 1500 ml medium

The next step is to fill containers with the liquid (cold cleaner) (Fig. 8). Put the stainless-steel containers into the ultrasonic bath and treat with ultrasonic for 6 minutes (Fig.9).

Fig. 8 Liquid addition

Fig. 9 Ultrasonic bath

Parameters for the ultrasonic bath acc. to WN70/13 U:

− Frequency: 40 kHz
− Power: 25 W/l
− Ambient temperature

After the ultrasonic bath, it is necessary to take out of the container the single parts and rinsed to remove particles attached to the part surface. Collect the rinsing medium in the stainless-steel container.

Finally, we provide filtration of the extraction fluids. The filter holder is assembled in a

few steps. Then use a tweezer to insert a filter (41 μm) onto the top of the neck. The position of the filter is fixed when you install the filter funnel on top (Fig.10).

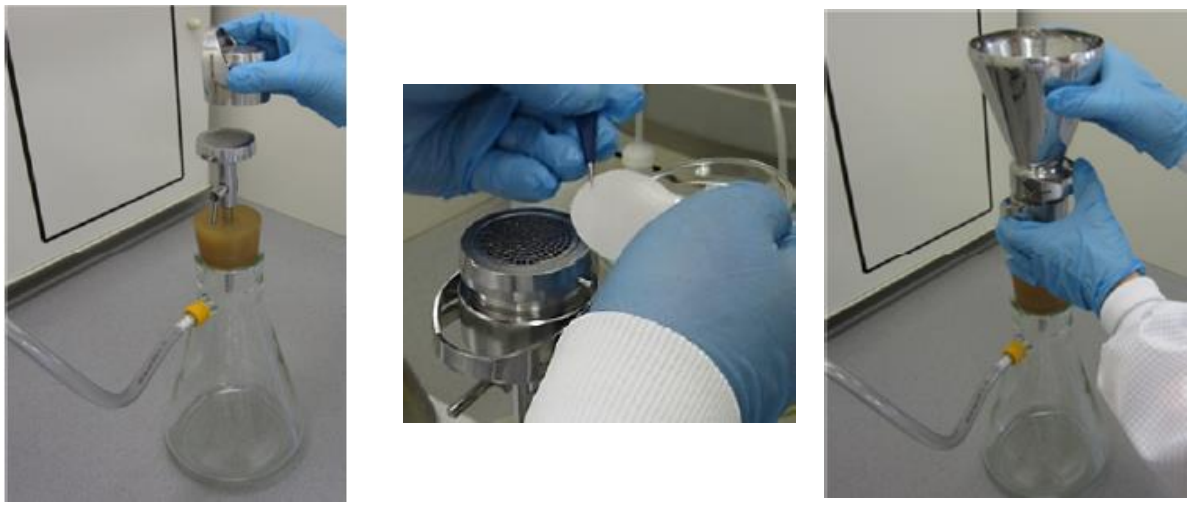

Fig. 10 Construction of filter equipment

Subsequently begins the process of filtering liquids from the containers. Pour the liquid from the reservoir tube over a separate filter. The walls and the bottom of stainless steel container are rinsed several times with spray gun and the fluid is poured over the filter. The funnel is rinsed two times in circulated movements. This time use cold cleaner from the wash bottle.

Fig. 11 Filtration

After that the funnel is removed and the filter even drawn to the watch crystal and cover with the right labeled watch crystal (Fig.12).

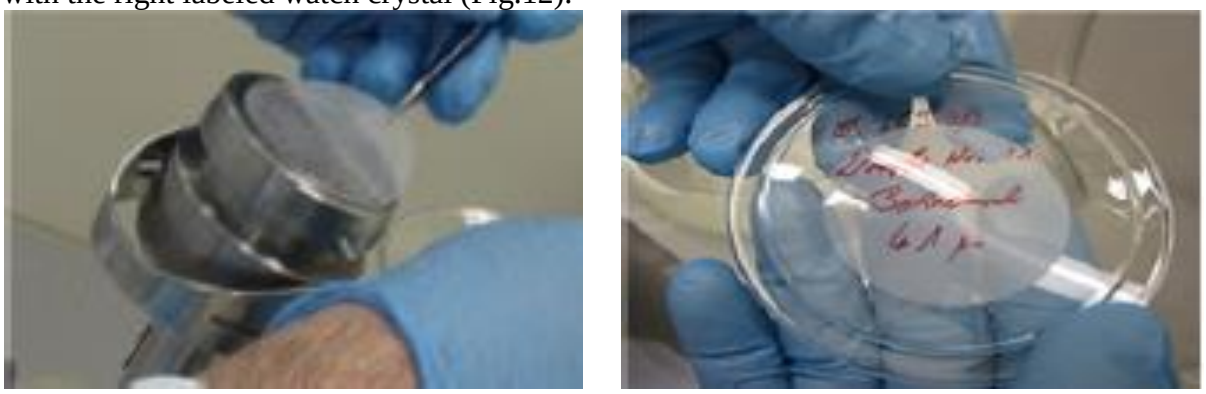

Fig. 12 Filter in the watch crystal

RESULTS

This procedure is repeated with all containers. So we get a four full samples that are inserted into the dryer (Fig.13).

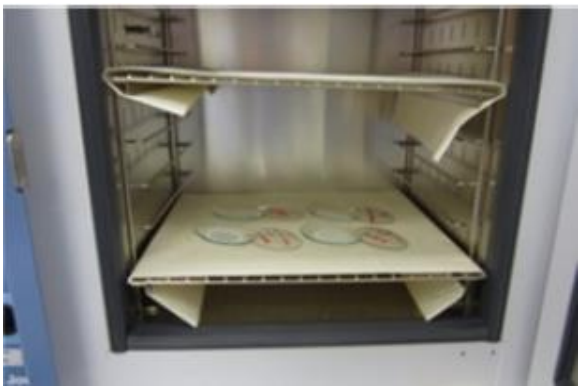

Fig. 13 The dryer

The four filters (blank value, container, valve components, oil) are dried in an oven without recirculating air at 100°C for one hour. After the drying, the filters need to be cooled down in the desiccator for one hour. As long as the filters are warm, the filter weight is incorrect.

CONCLUSION

The filters are analyzed gravimetrically and visually for the largest particles. Determine the weight of the filters (Fig.14) and perform visual inspection using the Jomesa microscope (Fig.15).

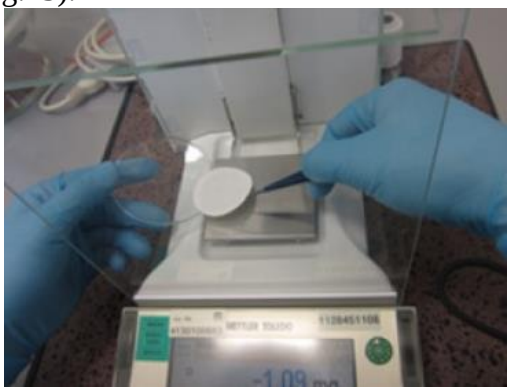

Fig. 14 Filter weighing

Fig. 15 Jomesa microscope

The Jomesa software automatically generates a log of the largest (shiny) metallic and (non-shiny) non-metallic particles as well as fibers [length, width]. A trained person has to verify the results of the Jomesa evaluation as recognition errors occur frequently. Bent particles are separated, for instance, so their measured length is shorter than they actually are. Also, particles may lie so close to or on top of each other that they are recognized as a single particle. In the first case, the parts of the particle need to be joined manually, and in the second case the particles need to be separated manually. Afterwards, the calculation is repeated and it has to be checked whether the corrections have been incorporated.

At the end, the final document shows the results of residual contamination and pictures from the Jomesa microscope. Once the evaluation is completed, the filters are archived in a plastic Petri dish. To do so, label the plastic Petri dish with the required data (inspection order number, part designation and/or part number, filter size).

ACKNOWLEDGEMENT

Supported by the Ministry of Education of the Slovak Republic, project VEGA no. 1/0718/17- "Study about the effect of technological parameters of the surface coating in agricultural and forestry techniques for qualitative parameters, safety and environmental acceptability"

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