

Why should vacuum suction devices be cleaned?

What can happen when you do this?

“But the vacuum lifter still carries the load. Why should I clean the suction cups?”

Always bear in mind that, during vertical transport, the friction between the suction plate and the materials being transported, the glass pane, is the only thing that is actually holding the materials being transported.

Walking on black ice, everyone will at some time have experienced just how difficult it is to stay on your feet when friction is not present. And it is exactly the same for a vacuum suction device when friction is lost, for example when holding a pane of glass. During vertical transport, when no friction is present, the load slips (in this example, the glass pane) off the suction plate. The lower the friction factor, the lower the vertical carrying capacity.

Through external contact with separating agents and other materials, as well as the migration of greases and fillers in rubber mixtures on the surface, and similar things, the friction characteristics of the vacuum suction device alters. We refer to this as the ageing of the suction cups. The more sediment builds up on the suction surface, and the more of it that penetrates into this surface, the more this impairs the friction factor of the vacuum suction devices. Then carrying capacity declines.

Surely that cannot have such a big effect, or am I wrong?

Well, we tested this on a suction cup that was about 5 years old. When the 388-4N-K suction cup is new, it can hold this 90 kg with a twofold safety factor. In other words, this suction cup is capable of holding a load weighing 180 kg for at least 5 minutes at a vacuum of -0.6 bar.

So what could a vacuum suction device really hope to hold after 5 years in service?

We got firmly to grips with this question by conducting tensile tests on our suction cup test fixture. For this, the vacuum suction device was attached by suction to a vertical glass pane. The vacuum measured approx. -0.6 bar. We generated this vacuum using an accumulator vacuum unit which we then switched off. Which meant that vacuum losses were not compensated for. A crane scale is installed between a threaded spindle and the suction cup that indicates the level of retaining force that has been generated. With the threaded spindle, the retaining force can then be increased to approx. 140 kg until the suction cup starts to slip. Even if retaining force is not stated in kg it is possible simply from the weight to establish what can actually be held in position by a vacuum suction device of this kind. Please bear with us as we now simply quote the supported weight as a parameter. This is how the vacuum suction device was left, and we then waited for 5 minutes.

What do you think then happens in this time?

The vacuum suction device continues to slip slowly, causing a gradual decline in retaining force. At the end, the crane scale was still indicating a robust figure of 47 kg. This is how we go about establishing the carrying capacity of vacuum suction devices. In their dynamic range, vacuum suction devices always achieve substantially higher carrying capacity than they do in the quasi-static range that we assume to exist after about 5 minutes.

What can you do to counteract this?

Now the cleaning operation is performed using a cloth saturated in methylated spirits, used to rub the vacuum suction device vigorously.

We have established that regular cleaning of vacuum suction devices with methylated spirits can help greatly to retain the friction factor of our vacuum suction devices for as long a time as possible. To do this, use a clean cloth soaked in methylated spirits to rub down the vacuum suction cups vigorously. To protect your skin, wear appropriate protective gloves to ensure that you only remove greases from the vacuum suction devices and not from your own skin.

What effect can cleaning have?

You are almost certainly about to ask what all of this can actually achieve.

Well, we have to admit that we ourselves were surprised by the result. Right at the outset, we can apply a load to the crane scale weighing approximately 270 kg and this only diminishes to about 218 kg five minutes later. That will not always be the outcome achieved, but this example clearly demonstrates how big a difference the cleaning of vacuum suction devices can make.

If you would like to watch the whole video clip, please visit our YouTube channel. Here is the direct link to that video:

<https://youtu.be/JO50hLEIRWA>

An example using a Kombi 7411-DS7Z vacuum lifter

We once received a Kombi 7411-DS7Z vacuum lifter after one year, for its annual inspection. The basic device with four 488-K vacuum suction devices was rated in-company for loads of 500 kg, and for loads of 375 kg on construction sites.

We used the vacuum lifter to apply suction to our steel plate, we installed a crane scale between device and crane hook and then we lifted it, taking the strain. At 475 kg the device slipped across the steel plate.

With all 4 vacuum suction devices, the device should really have been able to hold loads of 2 x 500 kg = 1000 kg. However, it was not even able to hold the nominal rating.

The first step was to clean the vacuum suction device with methylated spirits. After that, the test was conducted again, causing the value to rise to approx. 900 kg. This clearly shows that it accomplished a substantial improvement in carrying capacity.

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<https://youtu.be/WCFhLbDleEQ>

It was used in this condition despite the many references in the operating manual to the need for cleaning of the vacuum suction devices. Unfortunately, **one single** cleaning operation is not enough in itself to remedy everything.

Our advice

Vacuum suction devices should be cleaned on a regular basis to enable them to maintain friction levels for as long as possible.

If cleaning fails to restore full carrying capacity including the required level, you then need to replace the suction cups. You see, for a vacuum lifting device to be safe to use at a workplace, it has to satisfy the relevant safety factors.

Your personal safety and that of your payroll staff is at stake!