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## **Particle Collection Bin (PCOB) Change Over**

# Particle Collection Bin (PCOB) Change Over RFS Process Overview



Filter changes are a key aspect of machine maintenance in L-PBF. Filters remove fine particles and condensate from the process.

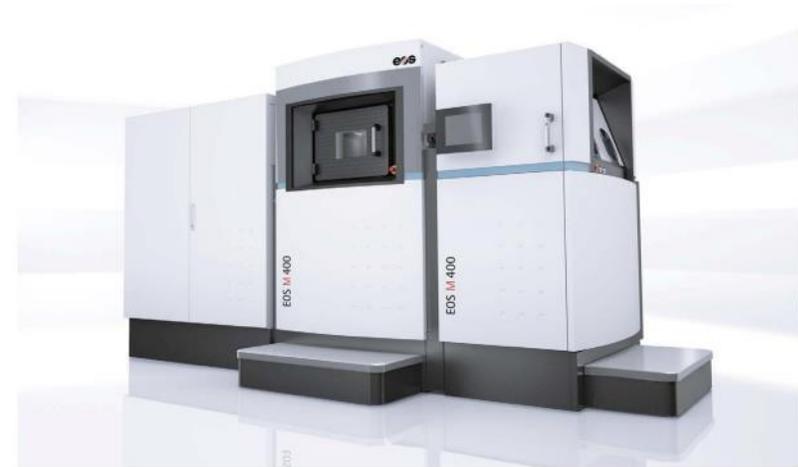
Condensate is nano-particles of the material ejected from the melting process and is highly flammable.

The highest risk when dealing with fine metal particles and condensate is when they are exposed to oxygen.

The filters in the M400 RFS are purged with inert gas to remove condensate from them in the machine and is collected in a metal particle bin. The particle bin can then be changed while the machine filters remain in the machine.

This training aims to show the user how to:

- Fill the passivation unit
- Replace the particle collection bin
- This training is not a replacement for the machine manual



EOS M400-4



# Particle Collection Bin (PCOB) Change Over RFS Process Overview

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# Particle Collection Bin (PCOB) Change Over Equipment & Consumables



Before starting the change over process, check that the following equipment and consumables are available:

- Passivation Funnel
- New Particle Collection Bin with lid and clamp
- 12L Silicone Oil
- 8kg Quartz Sand
- EOS Scoop
- 17 mm Spanner



Passivation Funnel



New Particle Collection Bin with Lid and Clamp



EOS Scoop



17 mm Spanner

# Particle Collection Bin (PCOB) Change Over Personal Protective Equipment (PPE)



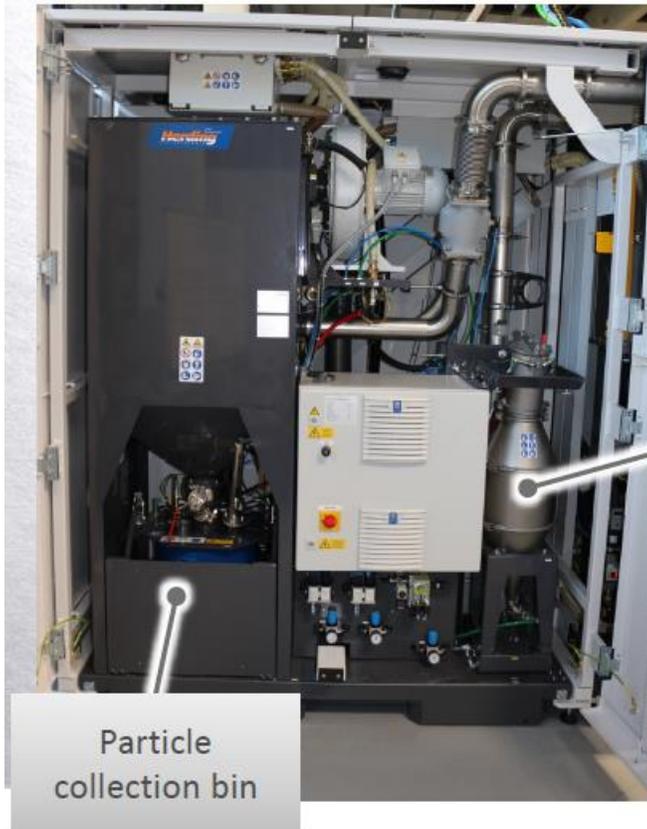
Particle Collection Bin (PCOB) change over is considered as a high risk activity, for which extended personal protective equipment (PPE) should be worn before starting the activities. In this regard, the required personal protective equipment (PPE) is as follows:

- Heat resistant gloves in accordance with EN 407
- Protective hood is fed air from a P3 rated filter respirator belt
- Closed protective clothing made of flame-resistant material
- ESD safety shoes EN 61340-4-3

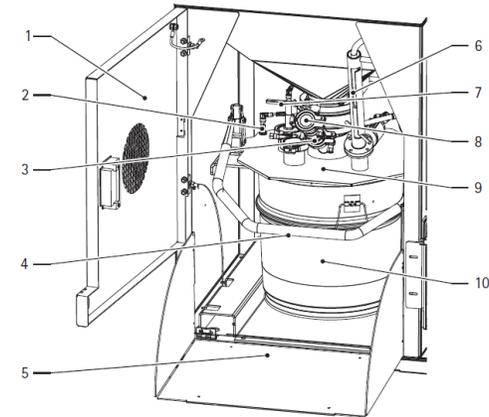


# Particle Collection Bin (PCOB) Change Over

## Step 1 – Machine Layout



- Show the relevant areas of the machine:
  - Start at front of machine highlighting HMI, then show rear with which door to open to access filter cabinet



- |   |   |
|---|---|
| 1 Guard with safety interlock                   | 6 Level sensor with bayonet connection  |
| 2 Ultrasonic sensor                             | 7 Passivation connection ball valve     |
| 3 Passivation connection                        | 8 Passivation connection cover          |
| 4 Particle collecting bin clamping bar          | 9 Particle collecting bin docking plate |
| 5 Particle collecting bin removal flap (opened) | 10 Particle collecting bin              |

Particle Collection Bin

EOS M400-4 Filter Cabinet

# Particle Collection Bin (PCOB) Change Over

## Step 2 – HMI

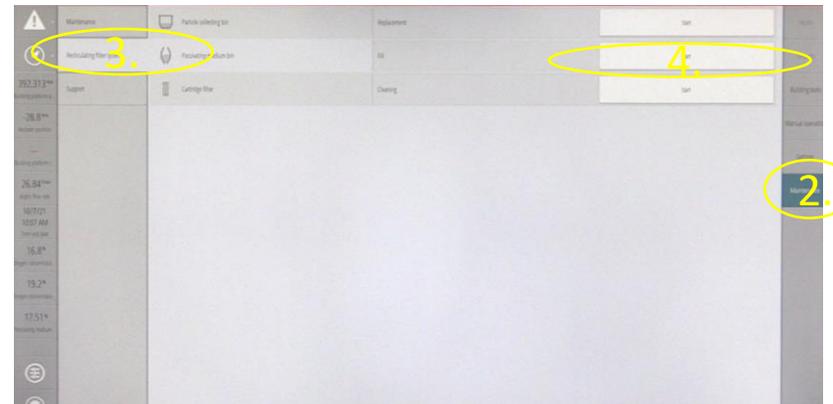


The First step is to log into the EOS M400 HMI and follow the instructions on the screen.

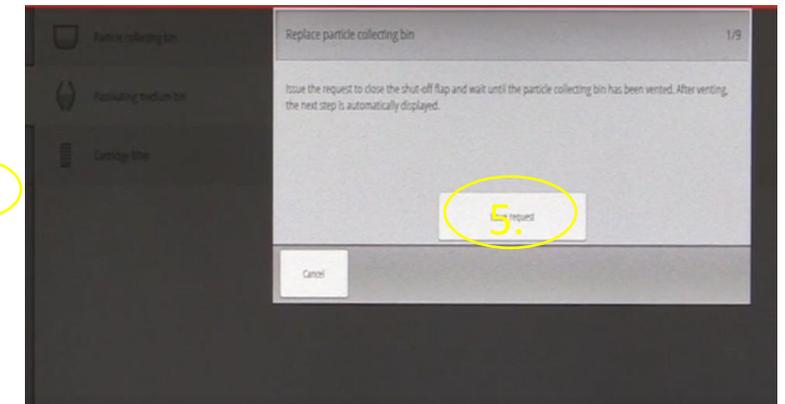
Note that you would have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions



EOS M400-4 HMI

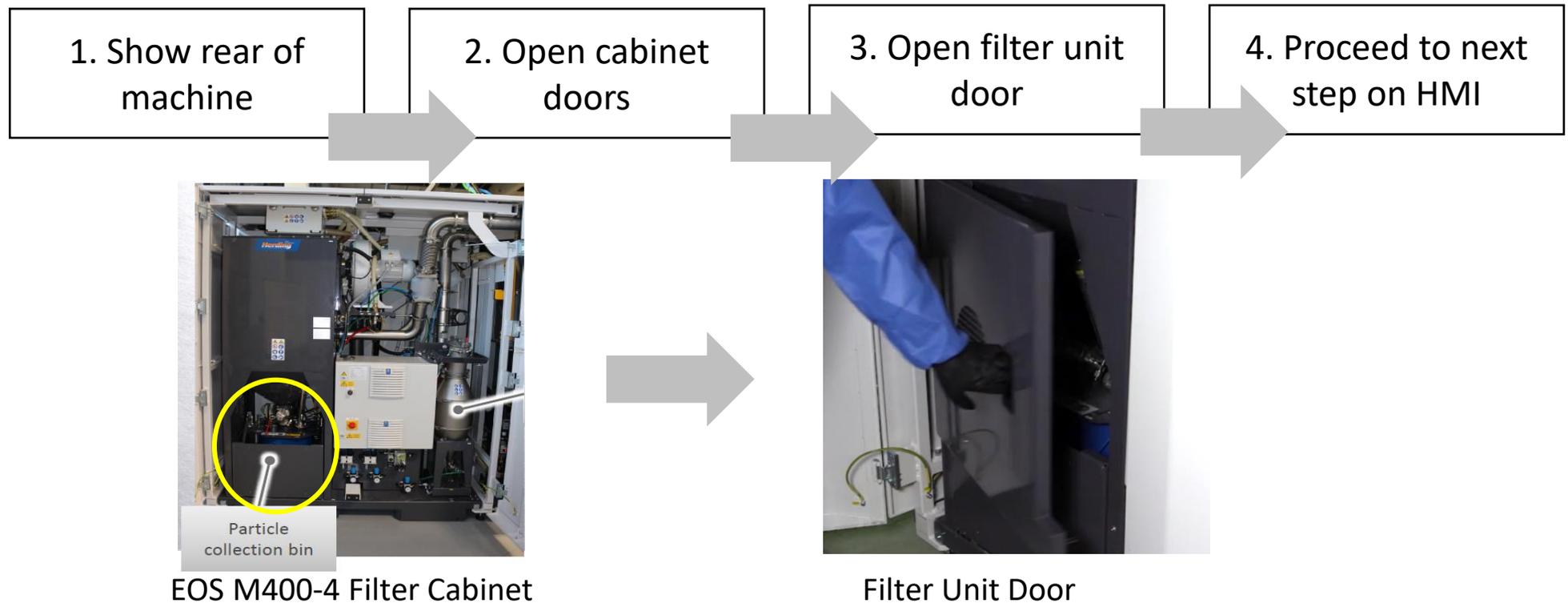


EOS M400-4 HMI Instructions for PCOB



# Particle Collection Bin (PCOB) Change Over

## Step 3 – Opening Rear of Machine



# Particle Collection Bin (PCOB) Change Over

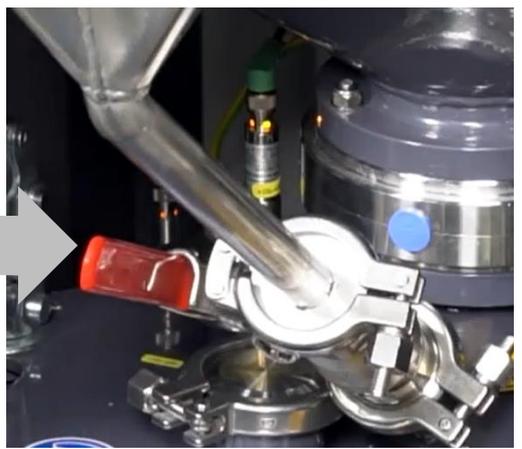
## Step 4 – Preparing for Passivation



1. Lift the particle bin nozzle valve handle and slide the funnel into the nozzle fully

2. Secure the funnel in place with the clamp and tighten with the 17 mm spanner

Note that at this point the condensate in the bin is now at its most exposed and therefore at greatest risk, should oxygen be forced down the funnel or the bin disturbed! 



Process of Preparing for Passivation

# Particle Collection Bin (PCOB) Change Over

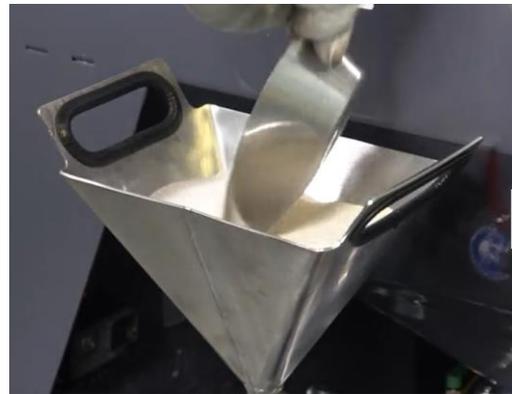
## Step 5 – Passivating the Bin



1. Scoop the 8 kg of quartz sand into the funnel, ensuring all sand has fallen into the bin before moving to the next step

2. Remove the funnel from the nozzle

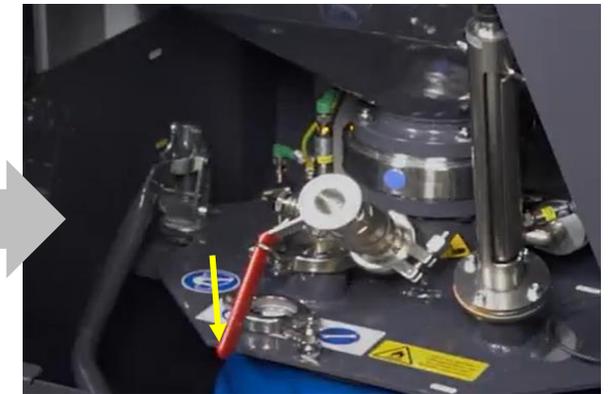
3. Close off the nozzle by closing the valve, pushing the valve handle down



Funnel



Nozzle



Valve Handle

Note - This will cover the contents of the bin with a thick layer of sand to prevent the condensate being directly exposed to atmosphere, reducing the fire risk



# Particle Collection Bin (PCOB) Change Over

## Step 5 – Passivating the Bin



Passivation Nozzle

4. Seal the passivation nozzle by reinstalling the cap and tighten with the 17 mm spanner that there is a sealing ring to be put between the nozzle and the cap. This is very important and should be included in the video as well

# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



- 1. Open the particle bin removal flap
- 2. Lift the particle bin handle up to release the bin from the seal



Particle Collection Bin

# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



Particle Collection Bin

3. Pull the particle collection bin out onto the open particle bin removal flap

Note - Be careful when moving the bin so as not to disrupt the sand covering the condensate



Note - Bin may be heavy and require 2 people to move as it may be heavy



Note - Metal condensate can spontaneously ignite if swirled up. During the removal of the particle collecting bin, the particle collecting bin may tip and an explosive atmosphere may be produced in combination with air by swirled up metal powder or metal condensate.

Have another person on standby with a cat D fire extinguisher to hand



# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



Particle Collection Bin

4. Lift the particle bin off the removal flap to somewhere suitable

Note - Be careful when moving the bin so as not to disrupt the sand covering the condensate



Note - Bin may be heavy and require 2 people to move as it may be heavy



Note - Metal condensate can spontaneously ignite if swirled up. During the removal of the particle collecting bin, the particle collecting bin may tip and an explosive atmosphere may be produced in combination with air by swirled up metal powder or metal condensate.

Have another person on standby with a cat D fire extinguisher to hand



# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



5. Gently fill the particle bin with 12l of silicone oil



Particle Collection Bin



Note - Filling may need to be done in stages to minimise disruption in the bin



Note - Be careful when moving the bin so as not to disrupt the sand covering the condensate



Note - Bin may be heavy and require 2 people to move as it may be heavy



Note - Metal condensate can spontaneously ignite if swirled up. During the removal of the particle collecting bin, the particle collecting bin may tip and an explosive atmosphere may be produced in combination with air by swirled up metal powder or metal condensate.

Have another person on standby with a cat D fire extinguisher to hand



# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



6. Cover the bin with the lid



Particle Collection Bin

7. Seal the bin lid with the clamp (labelling on the clamp must face upwards)



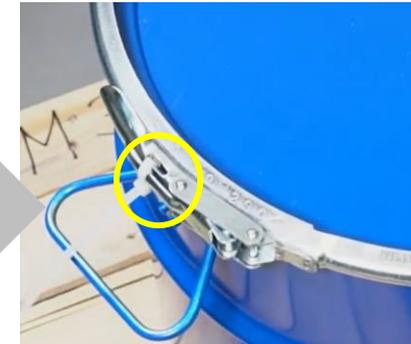
Clamp Label

8. Close the clamp fully using the tool



Clamp Tool

9. Put a zip tie through the clamp and label bin to identify as a dirty bin



Zip Tie

Note - Be careful when moving the bin so as not to do disrupt the sand covering the condensate



Note - Bin may be heavy and require 2 people to move as it may be heavy



# Particle Collection Bin (PCOB) Change Over

## Step 6 – Removing and Sealing the Collection Bin



10. Store the sealed particle bin in a suitable location for 48 hours to allow the silicone oil sufficient time to inert the condensate

11. Dispose of the particle bin through the appropriate route

Note - Bin may be heavy and require 2 people to move as it may be heavy



Note - Be careful when moving the bin so as not to disrupt the sand covering the condensate



Note - Metal condensate can spontaneously ignite if swirled up. During the removal of the particle collecting bin, the particle collecting bin may tip and an explosive atmosphere may be produced in combination with air by swirled up metal powder or metal condensate. Have another person on standby with a cat D fire extinguisher to hand



# Particle Collection Bin (PCOB) Change Over

## Step 7 – Fitting New Particle Collection Bin



1. Remove the lid and clamp of a new particle collection bin and store for the next bin change

2. Place the bin onto the bin removal flap

3. Line the bin up with the seal on the filter unit

4. Pull the particle bin handle down to seal and secure the bin in place

5. Close the particle bin removal tray



Bin Removal Flap



Particle Bin Alignment



Particle Bin Handle



Particle Bin Removal Tray

Note - If the seal is not aligned to the bin, the machine will not maintain the process atmosphere



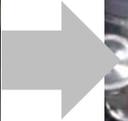
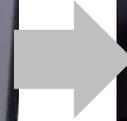
# Particle Collection Bin (PCOB) Change Over

## Step 7 – Fitting New Particle Collection Bin



6. The particle bin level limit switch is then lowered back into the particle collecting

7. Close the filter cabinet door so that the safety interlock can activate and allow the build to continue without interruptions



Particle Bin Level Limit Switch

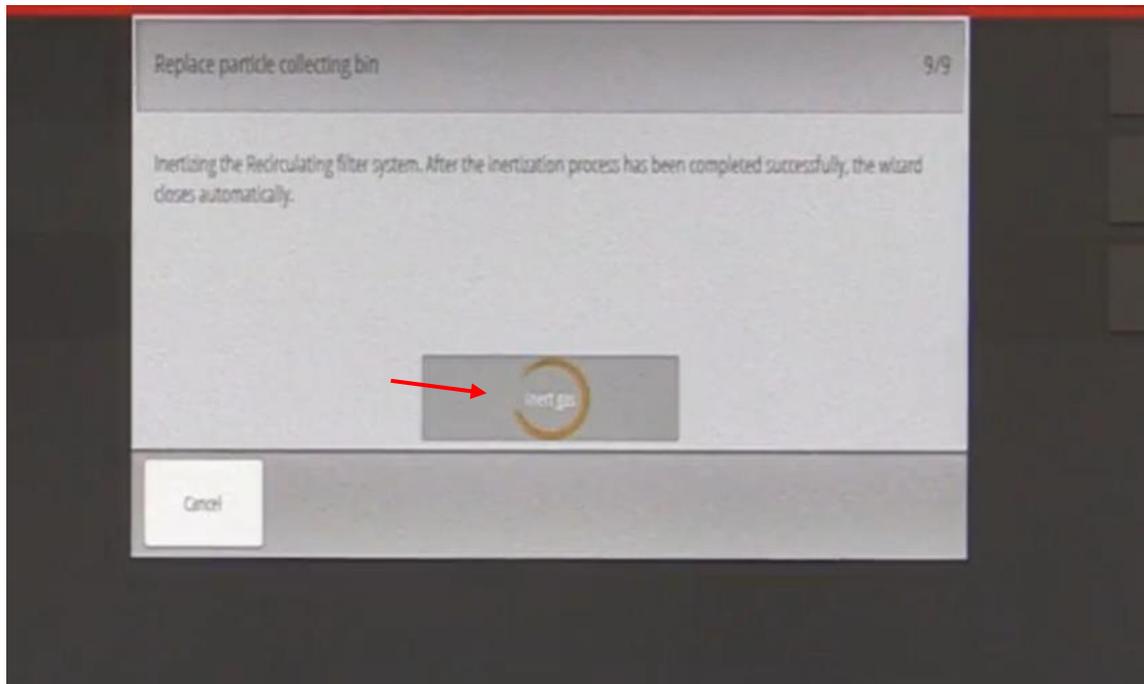
Filter Cabinet Door

Note - If the seal is not aligned to the bin, the machine will not maintain the process atmosphere



# Particle Collection Bin (PCOB) Change Over

## Step 7 – Fitting New Particle Collection Bin



M400-4 HMI

8. Return to the machine HMI and select inert gas to flood the new particle bin with inert gas

# RFS Process Overview

## Passivation Container Filling

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# Passivation Container Filling Equipment & Consumables

Before starting the passivation container filling process, check that the following equipment and consumables are available:

- Chalk Funnel
- Container for Passivation Chalk
- Scales
- Scoop / EOS Scoop

Note - 6 kg or  
amount specified on  
HMI of passivation  
chalk



Chalk Funnel



Container for Passivation  
Chalk



Scales



EOS Scoop



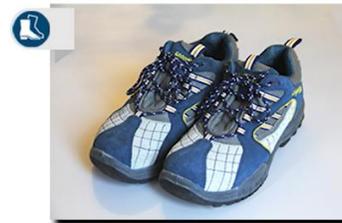
# Passivation Container Filling Personal Protective Equipment (PPE)



As a minimum, for passivation container filling process, the required personal protective equipment (PPE) is as follows:

- Safety glasses with side protection;
- Respirator (filter category F3);
- Disposable protective gloves;
- ESD safety shoes EN 61340-4-3;
- Closed protective clothing made of flame-resistant material;

However, the user can wear the same PPE as the particle bin operations if preferred.



# Passivation Container Filling

## Step 1 – Preparing Chalk



Container for Passivation Chalk

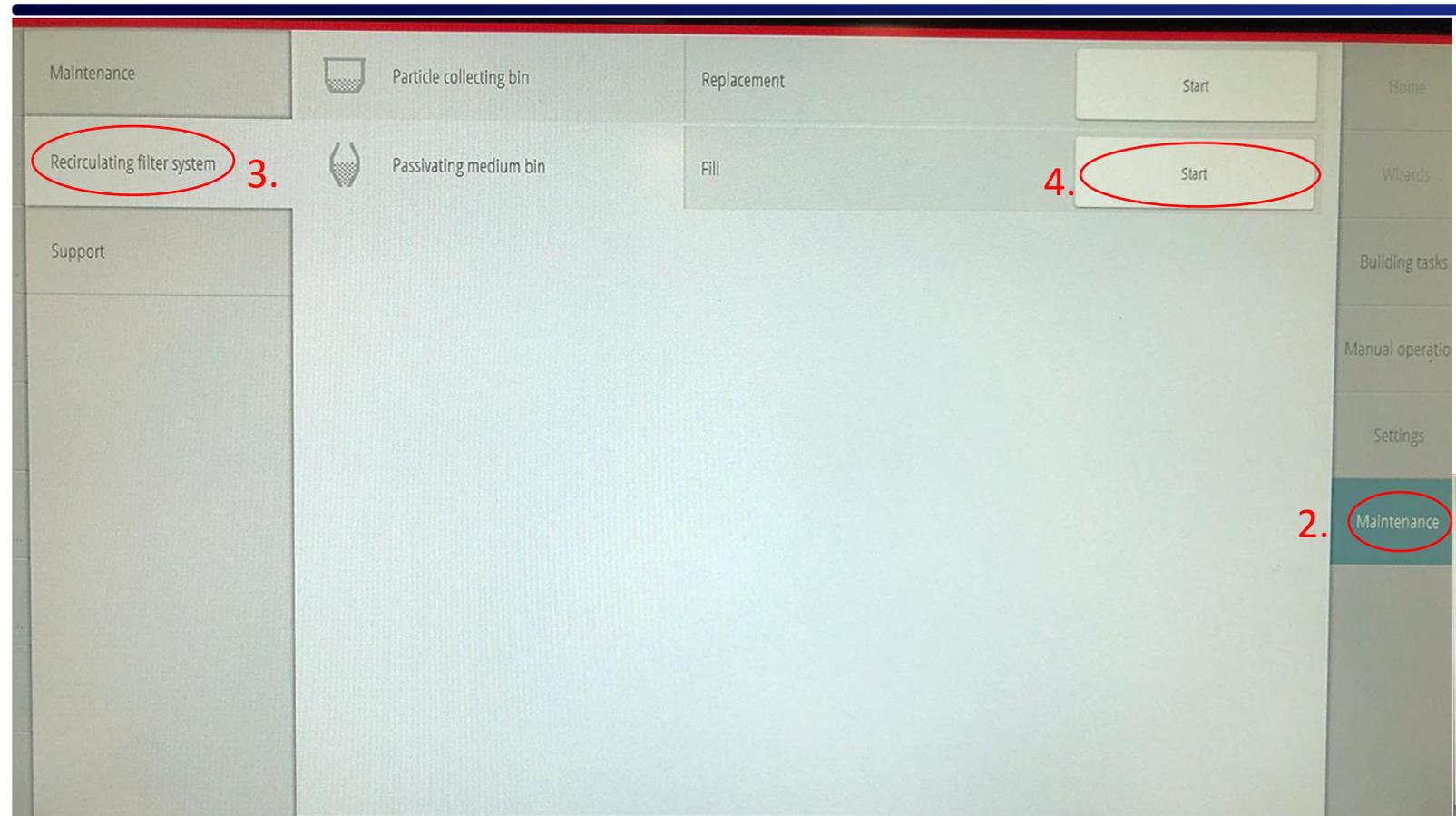
1. Fill the passivation chalk tub to the desired level on the scale (show EOS video)

Note – You have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions



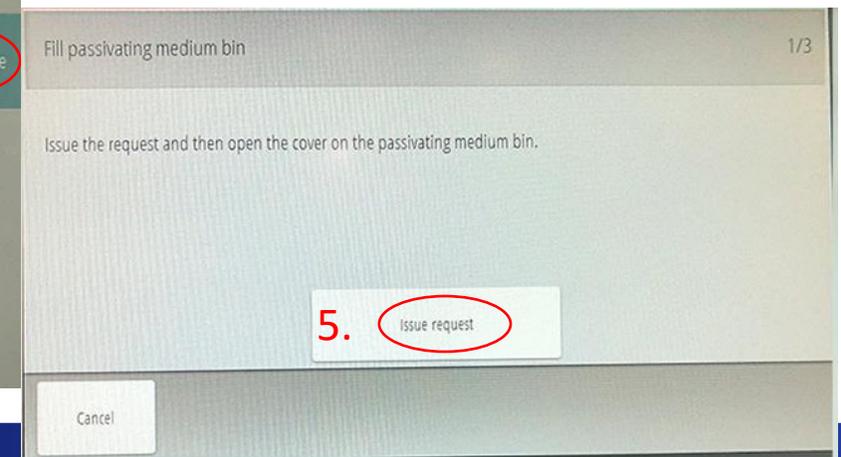
# Passivation Container Filling

## Step 2 – HMI Start Process



M400 HMI

Note – You have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions



# Passivation Container Filling

## Step 3 – Adding Passivation Media



1. Attach the passivation media funnel to the tub with the valve in the closed position

2. Open the lid of the machine passivation container by lowering the red handle and lifting the lid

3. Insert the passivation media funnel into the machine container

Note – You have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions 



Valve Closed Position



Passivation Container



Passivation Container Lid



Passivation Media Funnel

# Passivation Container Filling

## Step 3 – Adding Passivation Media



4. Fully open the passivation media funnel valve and leave for 30 seconds until all the media has flowed into the machine container

5. After 30 seconds pass, close the funnel valve and remove from the machine

Note – You have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions 



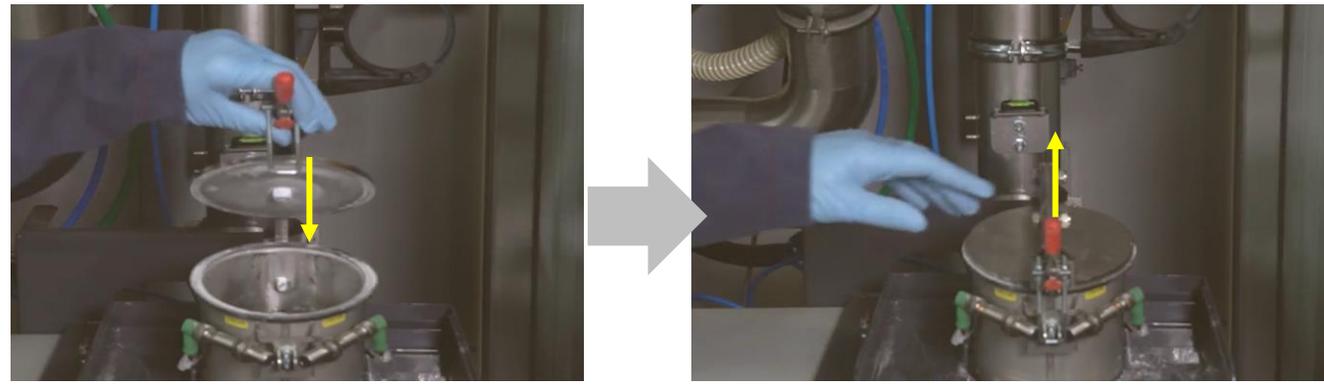
Passivation Media Funnel Valve



Passivation Media Funnel

# Passivation Container Filling

## Step 3 – Adding Passivation Media



Passivation Media Funnel

6. Fully open the passivation media funnel valve and leave for 30 seconds until all the media has flowed into the machine container

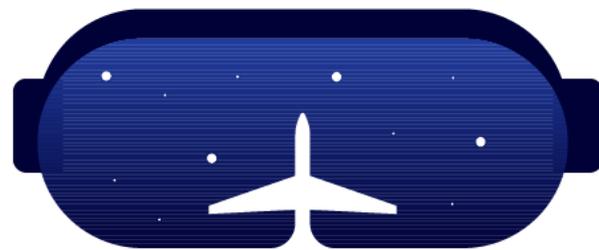
Note – You have 15 minutes to complete the operation if a build is running in the background to avoid build interruptions 



# Passivation Container Filling Recap



- 
- Prior to completing the actions for the first time, read the manual before complete. This is not a replacement for training or the manual...
  - Reiterate the need for PPE while carrying out filter operations.
  - The particle collection bin maintenance can take place while the machine is running, it must be performed in under 15 minutes to prevent build interruption.
  - Metal condensate can spontaneously ignite if swirled up. During the removal of the particle collecting bin, the particle collecting bin may tip and an explosive atmosphere may be produced in combination with air by swirled up metal powder or metal condensate.
  - Have another person on standby with a cat D fire extinguisher to hand for operations when handling the used particle bin out of the machine.



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