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# Cleaning Efficiency Analysis for the "ProfilGate" Tyre Cleaning System

Offer No.: 14 04 337 14



**Maschinenfabrik Heute GmbH & Co. KG**

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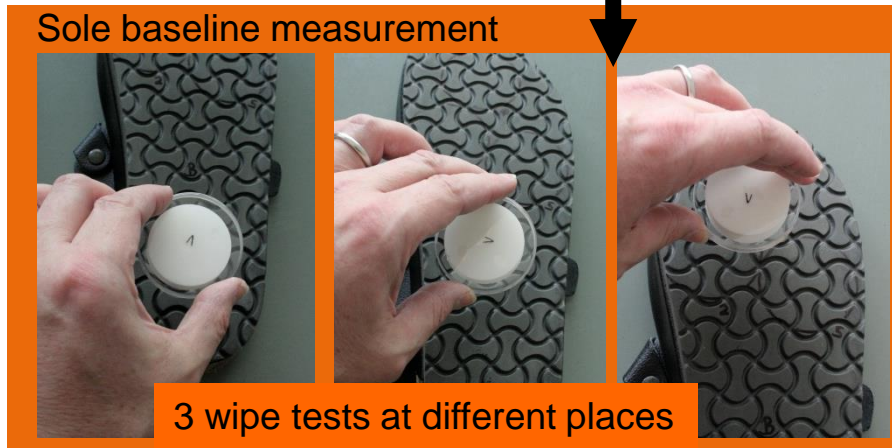
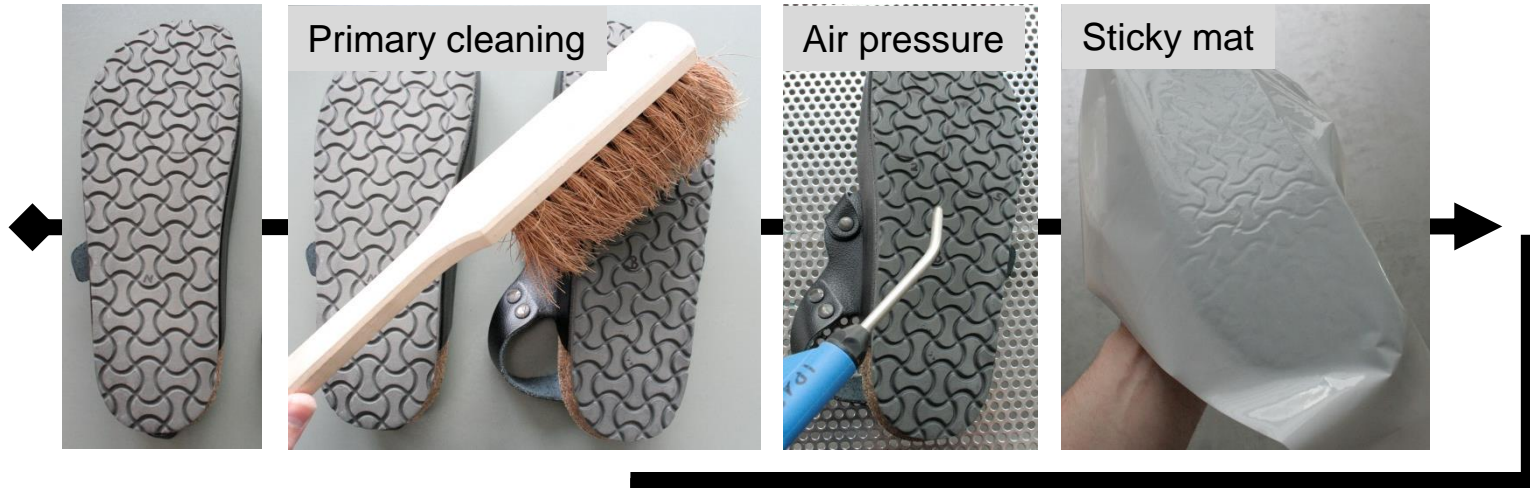
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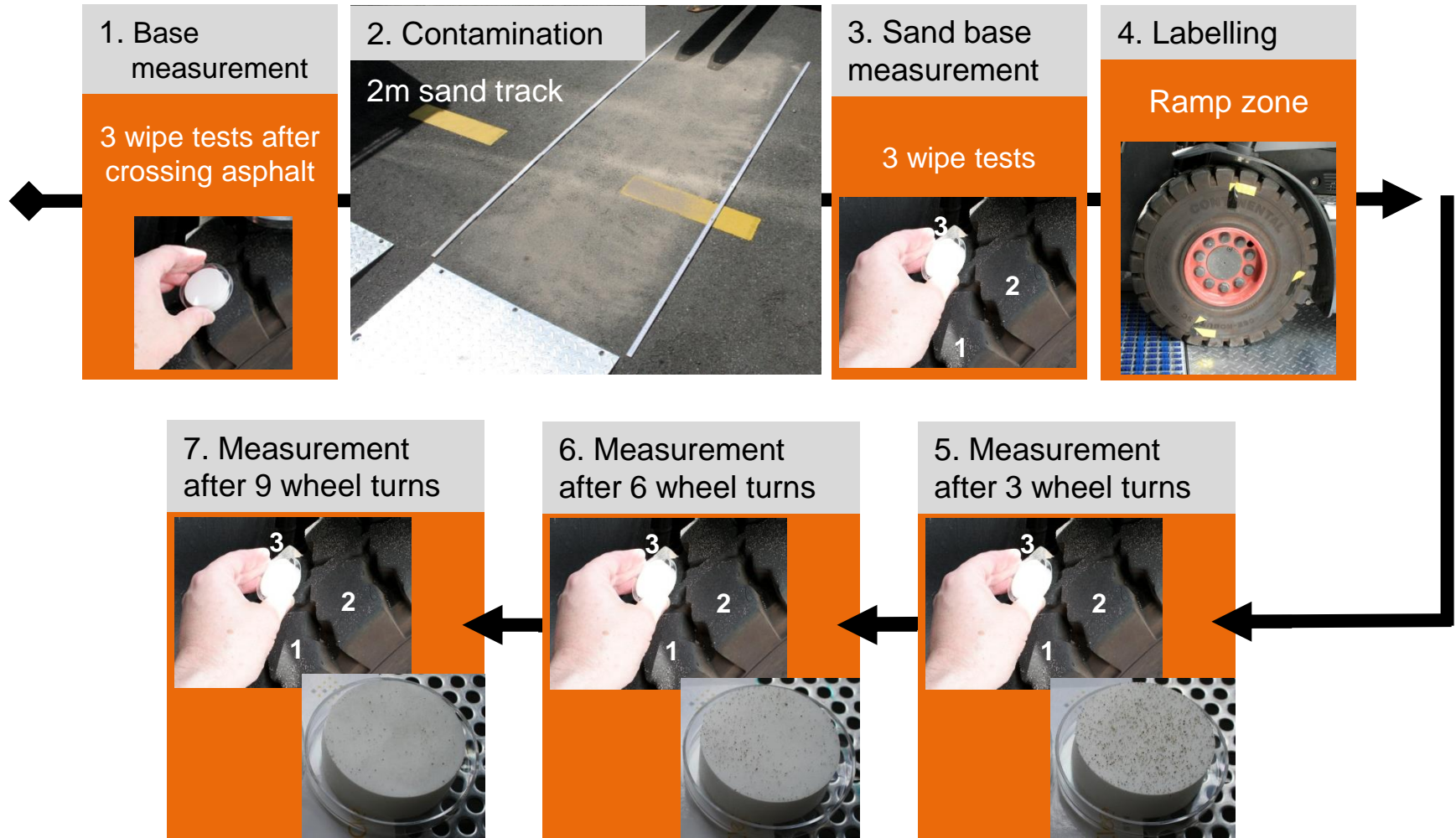
# 1.1. Microscopic evaluation Sole cleaning



Use of ProfilGate, after wipe test (like base measurement)

<sup>1</sup> Walking on sand causes an inhomogeneous allocation of the sand on the sole.

## 1.2. Microscopic evaluation Forklift tyre cleaning





# 1.3 Microscopic evaluation Trolley wheel cleaning

1. Base measurement

Wipe test after crossing asphalt



2. Contamination

2m sand track



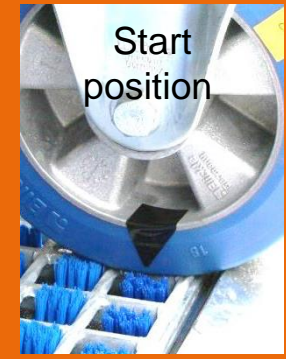
3. Sand base measurement

Wipe test after crossing asphalt



4. Labelling

Start position



5. Measurement after 9 wheel turns



6. Measurement after 6 wheel turns



5. Measurement after 3 wheel turns



## 2. REM-EDX evaluation

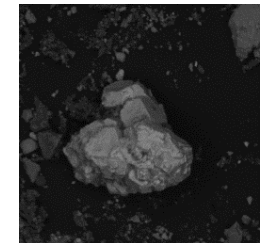
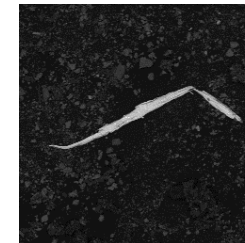
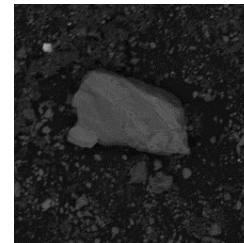
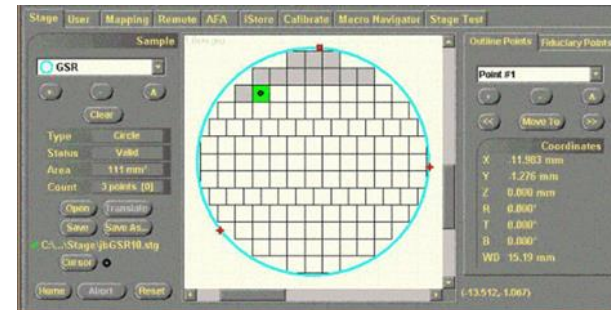
**Manufacturer:** RJL  
**Model:** PSEMeXplorer



1. Insertion of wipe tests.



2. Scanning and evaluating the wipe Tests for dirt / contamination



# 2.1 REM-EDX evaluation of sole cleaning

## Shoe wipe test



	Shoe			Shoe			Shoe			Shoe		
	Sand contaminated			2 steps			5 steps			10 steps		
	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm
Aluminum oxide	0	0	0	0	0	0	0	0	0	0	0	0
Al Alloy	2	0	0	0	0	0	2	0	0	0	0	0
Fe rich/PTFE	0	0	0	0	0	0	0	0	0	0	0	0
Al-K-F Lot	0	0	0	0	0	0	1	0	0	0	0	0
SiO2	93	0	0	50	1	0	49	2	0	16	0	0
Si/Si-C/Si-N	0	0	0	0	0	0	0	0	0	0	0	0
Mineral fibre	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	2176	166	3	1013	48	2	969	44	1	470	19	0
Chalk	32	0	0	20	0	0	13	1	0	12	0	0
Ca-P	1	0	0	1	0	0	2	0	0	0	0	0
Fe rich	0	0	0	0	0	0	0	0	0	0	0	0
UL Steel	0	0	0	0	0	0	0	0	0	0	0	0
NL Steel	3	0	0	7	0	0	2	0	0	3	0	0
HL Steel	9	0	0	4	0	0	6	0	0	1	0	0
Layer Mn-P	0	0	0	0	0	0	0	0	0	0	0	0
Layer Cr	0	0	0	0	0	0	0	0	0	0	0	0
Layer Zn	1	0	0	1	0	0	0	0	0	2	0	0
Fe rich	8	1	0	9	0	0	4	0	0	9	0	0
Layer V	0	0	0	0	0	0	0	0	0	0	0	0
Cu-Zn brass	0	0	0	0	0	0	0	0	0	1	0	0
Cu-Sn bronze	0	0	0	0	0	0	0	0	0	0	0	0
NE metal	1	0	0	0	0	0	0	0	0	0	0	0
Cl rich, PVC	0	0	0	0	0	0	0	0	0	0	0	0
Salts	2	0	0	0	0	0	3	0	0	0	0	0
Additivs	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
<b>Sum</b>	<b>2328</b>	<b>167</b>	<b>3</b>	<b>1105</b>	<b>49</b>	<b>2</b>	<b>1051</b>	<b>47</b>	<b>1</b>	<b>514</b>	<b>19</b>	<b>0</b>



	> 100 µm	> 200 µm	> 400 µm
Sand contaminated	2328	167	3
2 steps	1105	49	2
5 steps	1051	47	1
10 steps	514	19	0



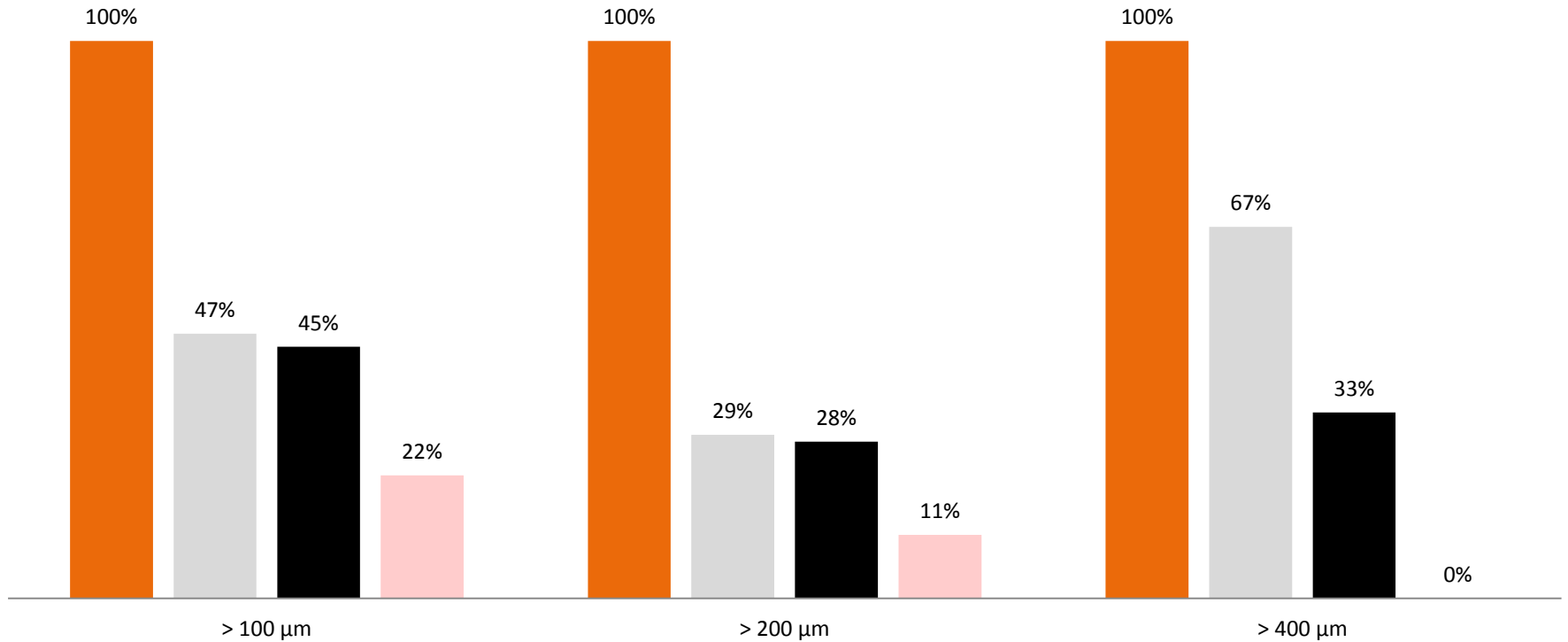
	> 100 µm	> 200 µm	> 400 µm
	100%	100%	100%
	47%	29%	67%
	45%	28%	33%
	22%	11%	0%

## 2.1 REM-EDX evaluation of sole cleaning Shoe wipe test



### Shoe

■ Sand contaminated ■ 2 steps ■ 5 steps ■ 10 steps



## 2.2 REM-EDX evaluation of tyre cleaning Forklift wipe test



	Forklift			Forklift			Forklift			Forklift		
	Sand contaminated			3 wheel turns			6 wheel turns			9 wheel turns		
	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm
Aluminum oxide	0	0	0	0	0	0	0	0	0	0	0	0
Al Alloy	2	1	1	1	0	0	0	0	0	0	0	0
F rich/PTFE	0	0	0	0	0	0	0	0	0	0	0	0
Al-K-F Lot	0	0	0	0	0	0	0	0	0	0	0	0
SiO2	334	301	122	140	112	46	72	49	17	52	25	6
Si/Si-C/Si-N	0	0	0	0	0	0	0	0	0	0	0	0
Mineral fibre	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	614	536	202	208	153	46	78	56	21	64	20	3
Chalk	46	33	4	14	10	1	7	3	0	7	2	0
Ca-P	0	0	0	1	0	0	3	1	0	1	0	0
Fe rich	0	0	0	0	0	0	0	0	0	0	0	0
UL Steel	0	0	0	0	0	0	0	0	0	0	0	0
NL Steel	3	0	0	1	0	0	1	0	0	1	0	0
HL Steel	0	0	0	0	0	0	0	0	0	0	0	0
Layer Mn-P	0	0	0	0	0	0	0	0	0	0	0	0
Layer Cr	0	0	0	0	0	0	0	0	0	0	0	0
Layer Zn	0	0	0	5	0	0	3	1	0	3	0	0
Fe rich	0	0	0	1	0	0	1	0	0	0	0	0
Layer V	0	0	0	0	0	0	0	0	0	0	0	0
Cu-Zn brass	0	0	0	0	0	0	0	0	0	0	0	0
Cu-Sn bronze	0	0	0	0	0	0	0	0	0	0	0	0
NE metal	0	0	0	1	0	0	0	0	0	0	0	0
Cl rich, PVC	0	0	0	1	0	0	1	0	0	0	0	0
Salts	0	0	0	1	0	0	0	0	0	0	0	0
Additivs	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	1	0	0	0	0	0	0	0	0
<b>Sum</b>	<b>999</b>	<b>871</b>	<b>329</b>	<b>375</b>	<b>275</b>	<b>93</b>	<b>166</b>	<b>110</b>	<b>38</b>	<b>128</b>	<b>47</b>	<b>9</b>



	> 100 µm	> 200 µm	> 400 µm		> 100 µm	> 200 µm	> 400 µm
Sand contaminated	999	871	329	→	100%	100%	100%
3 wheel turns	375	275	93		38%	32%	28%
6 wheel turns	166	110	38		17%	13%	12%
9 wheel turns	128	47	9		13%	5%	3%

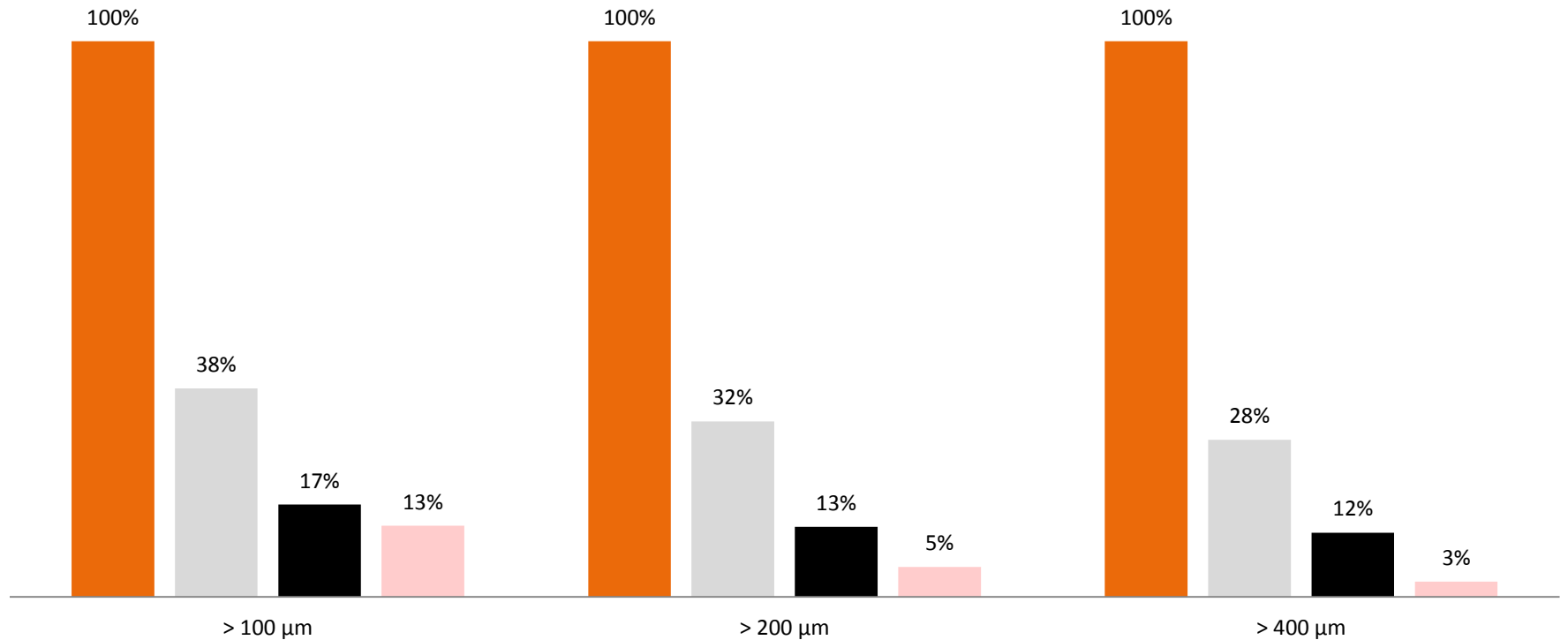


## 2.2 REM-EDX evaluation of tyre cleaning Forklift wipe test



### Forklift

■ Sand contaminated   ■ 3 wheel turns   ■ 6 wheel turns   ■ 9 wheel turns



## 2.3 REM-EDX evaluation of tyre cleaning Trolley wipe test



	Trolley			Trolley			Trolley			Trolley		
	Sand contaminated			3 wheel turns			6 wheel turns			9 wheel turns		
	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm	> 100 µm	> 200 µm	> 400 µm
Aluminum oxide	0	0	0	0	0	0	0	0	0	0	0	0
Al Alloy	0	0	0	0	0	0	1	0	0	0	0	0
Fe rich/PTFE	0	0	0	0	0	0	0	0	0	0	0	0
Al-K-F Lot	0	0	0	0	0	0	0	0	0	0	0	0
SiO2	200	184	113	46	32	11	21	10	3	4	1	1
Si/Si-C/Si-N	0	0	0	0	0	0	0	0	0	0	0	0
Mineral fibre	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	341	319	159	78	57	27	33	20	8	6	0	0
Chalk	15	12	1	4	4	1	5	3	0	1	1	0
Ca-P	0	0	0	0	0	0	0	0	0	0	0	0
Fe rich	0	0	0	0	0	0	0	0	0	0	0	0
UL Steel	0	0	0	0	0	0	0	0	0	0	0	0
NL Steel	0	0	0	0	0	0	2	1	0	0	0	0
HL Steel	0	0	0	0	0	0	0	0	0	0	0	0
Layer Mn-P	0	0	0	0	0	0	0	0	0	0	0	0
Layer Cr	0	0	0	0	0	0	0	0	0	0	0	0
Layer Zn	0	0	0	26	4	0	1	0	0	3	0	0
Fe rich	0	0	0	0	0	0	0	0	0	1	0	0
Layer V	0	0	0	0	0	0	0	0	0	0	0	0
Cu-Zn brass	0	0	0	0	0	0	0	0	0	0	0	0
Cu-Sn bronze	0	0	0	0	0	0	0	0	0	0	0	0
NE metal	0	0	0	0	0	0	0	0	0	0	0	0
Cl rich, PVC	0	0	0	0	0	0	0	0	0	0	0	0
Salts	0	0	0	0	0	0	0	0	0	0	0	0
Additivs	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
<b>Sum</b>	<b>556</b>	<b>515</b>	<b>273</b>	<b>154</b>	<b>97</b>	<b>39</b>	<b>63</b>	<b>34</b>	<b>11</b>	<b>15</b>	<b>2</b>	<b>1</b>



	> 100 µm	> 200 µm	> 400 µm
Sand contaminated	556	515	273
3 wheel turns	154	97	39
6 wheel turns	63	34	11
9 wheel turns	15	2	1



	> 100 µm	> 200 µm	> 400 µm
Sand contaminated	100%	100%	100%
3 wheel turns	28%	19%	14%
6 wheel turns	11%	7%	4%
9 wheel turns	3%	0%	0%

## 2.3 REM-EDX evaluation of tyre cleaning Trolley wipe test



Trolley

