

B4.3 Cleaning by Washing Method



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Index:

1. Objectives
2. Methods and Equipment
3. Results
4. Conclusions



Laboratory scale work

Objective: Using **basic materials** such as **distilled water**, and later, **chemical solvent**, contaminated foundry sand was put through a series of **washing processes** in an attempt to render it suitable for **reuse** as foundry sand.



MATERIALS

1. Distilled water
2. 5M HCl

EQUIPMENT

1. Mufla furnace T^a max 230°C
2. pH flask
3. Filter paper of 0.45 μm
4. Precipitate glass of 2 litres
5. Magnetic mixer (300 rpm)
6. Büchner funnels of 2 litres
7. Erlenmeyer flasks of 2 litres
8. Vacuum filtration system

In all, approx. 100 kilos of sand were washed. The sand tests started at 30 up to 450 grams.

2. METHODS AND EQUIPMENT

1. Sand and ambient temperature distilled water were mixed in a flask at a ratio of 1:2. This was agitated by hand and pH was taken. $2\text{HCl} + \text{Fe} \rightarrow \text{FeCl}_2 + \text{H}_2$
2. The mixture was then filtered to recover the sand and the process repeated until a decrease in pH to 9.35 was observed i.e. as near-neutral as practical.



pH test



Büchner funnels equipment

3. The washed sand was then mixed in a flask of HCl at a ratio of 1:5
4. The flask was placed in a magnetic agitator for 8 hours at 300 rpm.



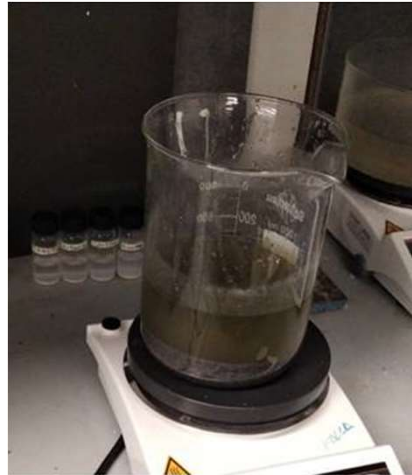
Filtering the sand



Magnetic agitator



5. This mixture was filtered and the sand was washed with distilled water one more time.
6. The samples were furnace-dried for 30 minutes at 105°C.



Total metal (mg/kg)	Before washing	After washing	Washing efficiency
Barium (Ba)	7.85	4.55	42
Chromium (Cr)	335.00	163.00	51
Iron (Fe)	15,800.00	13,400.00	15
Molybdenum (Mo)	3.24	<2.00	38
Nickel (Ni)	718.00	640.00	11
Zinc (Zn)	13.20	10.50	20

Hazardous elements (mg/kg)	Before washing	After washing	Washing efficiency
Fluorides	7.80	<5.00	36
Phenol	0.80	<0.50	38
DOC	480.00	169.00	65
TOC	8,900.00	<1,000.00	89
BTEX	0.22	<0.04	100

1. The chemical washing process explained here reduced residual metals from tested waste foundry sand.
2. The basic materials were effective and could be reused.
3. Different sample sizes gave similar washing efficiency results.
4. The washed sand was fit for use in cores.

Thank you

patricia.caballero@tecnalia.com



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