

# Reduction of Heavy Metals in Sludge by EM Treatment

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**Abstract :** Supported by the Danish Environmental Ministry, EMRO Denmark has carried out experiments with EM treatment of sludge from waste water in order to control heavy metal among other things. By comparing the results from tests of heavy metal in EM treated compost and pure water treated compost shows, that the EM treated compost contained smaller amount of all heavy metals.

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**Experiment** Sludge from waste water was treated with:

1. EM Bokashi
2. Water Bokashi

This Bokashi was made of wood chips mixed with:

- a. Water, molasses and EM (EM Bokashi)
- b. Pure water (Water Bokashi).

The Bokashi was fermented anaerobically over 2 weeks. After fermentation the Bokashi was mixed into the sludge, at a proportion of 1:1. Each mixture contained 12 kg sludge and 12 kg Bokashi. The mix of sludge and Bokashi was then anaerobically fermented over 4 weeks.

**Results** The untreated sludge was analysed for the content of heavy metals, and following amounts were found:

**Table 1. Heavy Metal Contents in Untreated and Treated Sludge**

Heavy Metals	Untreated Sludge Mg/kg dry matter	EM Treated Sludge	"Water" Treated Sludge	Difference in Per cent
Cadmium Cd	1.7	0.76	0.96	20.8
Chrome (Cr)	29	14	18	22.2
Copper (Cu)	360	110	160	31.3
Quicksilver (Hg)	2,0	1.1	1.5	26.7
Nickel (Ni)	32	13	16	18.8
Lead (Pb)	55	27	29	6.9
Zinc (Zn)	900	360	500	28.0

The percent differences between the content of heavy metals by EM treated and "water" treated sludge are shown in Table 1. These differences show, for all heavy metals the content in the EM treated sludge is lower than in the water treated sludge. The gap between the differences is from 6.9 percent to 31.3 percent.

**Discussion and Conclusion** Because the treated sludge contains 50 percent wood chips, which contain smaller amounts of heavy metals compared to the untreated sludge, it was expected that the content of heavy metals in the treated sludge would be at a lower level as in the untreated sludge (up to 50 percent).

In relation to the differences between the EM treated sludge and the water treated sludge a systematic error cannot be excluded, but the large gap between the differences indicates that a systematic error cannot be the whole explanation.

Our opinion is, that EM treatment of sludge can reduce the content of heavy metals. The question is, what actually happens to the heavy metals ? Our conclusion is that the micro-organisms in EM have the ability and power to change the ionisation of heavy metals, so the heavy metals are not detected by the test. Non-ionised heavy metals are not taken up by plants, and therefore not harmful.