

# CO<sub>2</sub> case: Teknos fluoroplastic coated paint vessels

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## Relevant data from Teknos

Number of vessels: 25  
Size: Mean size app. 1.100 litre  
Normal batch: 800 kg/l  
Number of cleaning's: 200 per day

## In comparison to a non-coated vessel

Reduced waste: 1%  
Saved man-hour per wash: 25 minutes  
Use of cold water: Saves 60 litre per washing

Calculation of savings: See calculation data below

Less waste: 800 kg x 1/100 x 200 washings x  
200 days = 32.000 kg per year

Less waste in DKK: 32.000 kg x 10 DKK (estimate by Acccoat) =  
DKK 320.000 per year

Saved man-hours: 25 minutes x 200 cleaning's  
x 200 days = 100.000 minutes = 100.000/60 =  
1.666 hours per year

Saved man-hours in DKK: 1.666 man-hours  
x estimated pay/hour DKK 150 = DKK 249.900 per year

Saved water: 60 x 200 litre per day in 200 days =  
2.400.000 litre = 2.400 m<sup>3</sup>

Saved cost of water: 2.400 m<sup>3</sup> a DKK 45 = DKK 108.000

**Total saved per year** **DKK 677.900**

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The 25 vessels have a value of app. 25 x 8.200 DKK = DKK 205.000  
(DKK 8.200 is a mean price for 7 different vessels)

Pay back time 205.000 / 677.900 = 0.30 year = 3.6 months

(This calculated price agrees very well with the one found in (5)).

Savings relating to pumps and electrical equipment are not included.

### **CO<sub>2</sub> savings for Teknos**

Waste: 32.000 kg á 2 kg CO<sub>2</sub> per kg waste = 64.000 kg CO<sub>2</sub> per year

Man-hours: 1.666 timer x 1.14 kg CO<sub>2</sub> per. Danish person/hour = 1.900 kg CO<sub>2</sub> per year

Water: 2.400 m<sup>3</sup> of 0.80 kg CO<sub>2</sub> per m<sup>3</sup> = 1.920 kg CO<sub>2</sub> per year

Total CO<sub>2</sub> savings per year: 71.320 kg CO<sub>2</sub>

Life-time for the coating of a vessel is stated to about 10 years by Teknos.

**Total savings in the span of life for the vessels: 71.320 x 10 = 713.200 kg CO<sub>2</sub>**

For comparison Acccoat emits by coating of the 25 vessels app. 10.600 kg CO<sub>2</sub>  
or 67 times less.

### **Basis for the calculations**

1 m<sup>3</sup> water "consumes" 0.80 kg CO<sub>2</sub>

1 kg water based paint "consumes" app. 2.0 kg CO<sub>2</sub>

1 man-hour emits 10.000 kg CO<sub>2</sub> / 365 x 24 = 1.14 kg CO<sub>2</sub>  
(each Dane emits 10 tons CO<sub>2</sub> per year)

Water costs per. cubic meter (water + getting rid of it): DKK 45

## **Acccoat's use of energy by coating the vessels.**

### **Background:**

Coating: Accopon 2G inside and Accopon 1G outside. 2G = 2 times coating 1G = one time. A primer is necessary for this coating

Teknos sends a batch of about 10 vessels for coating or recoating at a time. 3-4 of these are so filled with paint residues, that they have to be heat treated (pyrolysis) environmentally safe by a special company. In the future they may be treated with water at high pressure, as this is cheaper and less energy consuming. The energy used for these processes has not been taken into account.

If the vessels are only coated inside 2 vessels may be in the oven. If they are coated also on the outside only one vessel is in the oven at a time.

## The Process in details, inside coating with Accopon 2G

Process	m <sup>3</sup> N-gas	Hours gas	KWh	Man-hours	CO <sub>2</sub>
Heat-treatment 1hour metal temperature, 1hour 400°C	40	2	?	1	91.2
15 minutes sling cleaning			75	0.5	34.3
Sandblasting			105	1	47.1
Priming P54 120°C 1 hour	10			0.5	23,1
1. Coat Accopon G 3 hour 370°C	50	3		0.5	113.6
2. Coat Accopon G 3 hour 370°C	50	3		0.5	113.6
Control				0.5	0.6
<b>Total amount CO<sub>2</sub> per 1.000 litre vessel</b>					<b>423.5</b>

Total amount CO<sub>2</sub> emitted by coating one paint vessel of about 1.000 litre = 423.5 kg CO<sub>2</sub>

Total amount used for 25 vessels = 423.5 x 25 = 10.588 kg CO<sub>2</sub>

General use of electrical equipment, pressurised air, ventilations etc. has not been taken into account.

### Basis for calculations

The amount of gas is from the gas meter on the oven. This includes also the gas used for heating to the process temperature.

KWh is for motors and other process equipment.

Man-hours are for the actual time used including preparations.

1 nm<sup>3</sup> natural gas emits 2.253 kg CO<sub>2</sub>

1 KWh emits (in this part of the world) 0.449 kg CO<sub>2</sub>

1 man-hour "emits" 10.000kg CO<sub>2</sub> / 365 x 24 = 1.14 kg CO<sub>2</sub>  
as every Danish person emits 10 tons CO<sub>2</sub> per year

## Conclusion

It is evident that Teknos saves far more totally than the energy Acccoat uses in its production by coating the vessels. Calculated as CO<sub>2</sub> Acccoat uses 67 times less than what Teknos saves in the app. 10-year life-time of the coating.

Besides this the customer saves about DKK 70.000 per year and about DKK 700.000 in the life-span of the vessels by reduced waste, less water for cleaning and fewer man-hours used.

The pay-back time for the vessels is calculated to about 3.6 month.

## References

1. Data for Teknos's cleaning of the vessels etc. has been submitted by Environmental Manager at Teknos: Rikke S. Østergaard, phone: +45 76939468
2. CO<sub>2</sub> emission for water has been given by DANVA, Jan Egelund Andersen, phone: +45 87933564
3. Emission of CO<sub>2</sub> from natural gas is obtained from DGC, 'Dansk Gasteknisk Center'
4. CO<sub>2</sub> from 1 kg water-based paint is obtained from Force Institute; Anders Smith, phone +45 43267000
5. Clean technology in the Paint- Lacquer and Adhesive industries, report 57, The Environmental Institute 1994 (Renere teknologi i Farve- lak og limindustrien, rapport 57, Miljøstyrelsen 1994).