



## FuturZement | FuturBeton

*nanostructured green cement/concrete*

high strength ☀ CO<sub>2</sub>-low ☀ super durability

all advantages for EUR 7,00 / ton of concrete

(additional full cost, Simoloyer® CM900, Germany 2012-10)



### CO2-Emission Saving-Cost

*automobile vs. total processing cost HKP-GGBS*

Cement is mankind's product utmost relevant to manmade CO<sub>2</sub>-emissions while most efforts in CO<sub>2</sub>-saving are undertaken at automotive industry, even modern vehicles already operate quite CO<sub>2</sub>-clean. The cost-comparison for further CO<sub>2</sub>-saving in automotive vs. HKP/FuturZement suggests that this is economically wrong.

This is even valid, if for comparability, the value of FuturZement res. of HKP-GGBS is set to zero, thus HKP would aim CO<sub>2</sub>-saving only and HKP-GGBS/FuturZement would come along as a zero-value side-product.

primary target CO <sub>2</sub> -emission saving, additional cost [7] (2013)		<b>Auto</b>	<b>CM900</b>		total processing cost HKP-GGBS, CO <sub>2</sub> -saving as a side-effect
CO <sub>2</sub> -emission today	[g/km]	136	140	[€/t]	total processing cost (2012)
CO <sub>2</sub> -emission base (target 2015)		130			
CO <sub>2</sub> -fleet-goal		95	395	[kg/t]	CO <sub>2</sub> -saving per replaced ton OPC-fraction in FuturZement
CO <sub>2</sub> saving (-CE-)		35			
CE at 12.500 km p. a. / 12 years	[t/vhc]	5,3	0 !!	[€/t]	product value share of FuturZement
additional cost / vehicle (-vhc-)	[€]	3.600			
<b>additional cost for CO<sub>2</sub>-saving</b>	<b>[€/t]</b>	<b>678</b>	<b>354</b>	<b>[€/t]</b>	<b>total cost for CO<sub>2</sub>-saving</b>

[7] Communication with Dr. Ulrich Eichhorn, Managing Director VDA (Association of the German Automotive Industry, Berlin [05-2013])

The simple but full cost calculation from 2013 (not updated) gives the surprising result, that society could save 2x more CO<sub>2</sub>-emission for the same cost (€678/t vs. €354/t) if investing into clean cement manufacturing.

Result does NOT take into account, that

- (a) due to higher concrete strength, less material for the same construction is required and due to the virtually endless durability, we would build less often
  - (b) cement res. FuturZement itself has a value, in fact as high as UHPC
  - (c) automotive at million-fold production is compared to a single Simoloyer®
- (a-c) **multiply efficiency and CO<sub>2</sub>-savings at significantly lower cost.**



### **Game changer, high potential or fairytale ?**

If national concrete consumption is 250 Mt, 5.787 units CM900 could cover the German market. In mass production/application, 40% performance increase at 70% equipment cost decrease may be predicted. Thus 3.472 units would cover DE where the remaining additional cost per ton of concrete at stable energy/labor-cost would decrease for about 6% from 7€/t to about 6.6€/t respectively (2013).

Assuming that 4 times higher strength at 4 times longer durability would lead to the saving of at least 50% of concrete required, **1.736 CM900-units would cover DE.**

If Germany has 50 cement manufacturing sites, this would refer to 35 CM900-units per cement plant requiring floor space in the range of one single cement rotary kiln usually 60-90m long at a diameter up to 5 meters. Ø5m x 60m provides a processing volume of 1.000 m<sup>3</sup>. 35 units CM900 provide 31.5 m<sup>3</sup> chamber volume.

If service time of CM900 is 20 years, in Germany 1.736 CM900-units would need to be manufactured in such period resulting in 87 units p.a. or 8 units p.m.

**So far, this is not science fiction.** See OnePager "Emission CO<sub>2</sub> vs. Government"