

EFCA ENVIRONMENTAL DECLARATION SUPERPLASTICISING ADMIXTURES – March 2006.

SUPERPLASTICISERS

Admixtures are an important component of concrete, together with the cement, water, aggregates and, where applicable, reinforcing steel. Superplasticisers currently make up about 38% of all admixtures sold in Europe. Normal plasticisers account for a further 40% and are the subject of a separate EFCA Declaration Sheet.

EFCA Declaration Sheets also exist for Waterproofing admixtures, Accelerators, Retarders and Air entraining admixtures.

Superplasticisers, also known as High Range Water Reducing admixtures, are synthetic, water-soluble organic chemicals that significantly reduce the amount of water needed to achieve a given consistence in fresh concrete. This effect can be utilised in two ways:

- To reduce water content for increased strength and reduced permeability / improved durability
- As a cement dispersant at the same water content to increase consistence and workability retention

With a slightly higher admixture dosage, both these effects can be achieved in the same mix.

This Eco-profile is only valid for superplasticisers and is representative for all four main groups of superplasticisers used in concrete:

- Sulphonated naphthalene formaldehyde
- Sulphonated melamine formaldehyde
- Vinyl copolymers
- Poly carboxylic ethers.

These may be factory blended with each other or with 'normal plasticisers' to give superplasticisers with carefully targeted properties.

The superplasticisers are dissolved in water and typically contain 30-45% active matter.

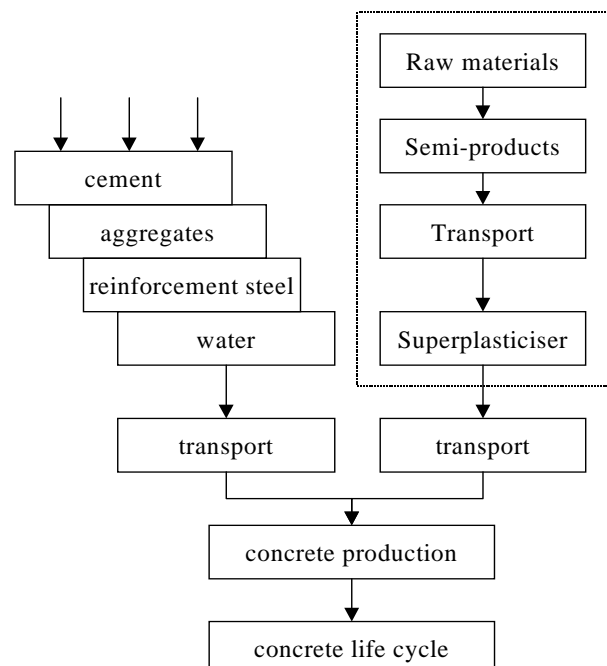
SCOPE OF THE ECO-PROFILE

The Eco-profile covers cradle-to-gate production of superplasticisers in Europe. Transport of superplasticisers from fabricator to customer is not included.

Members of EFCA, the European Federation of Concrete Admixtures Associations collected manufacturing data for synthesis and blending of superplasticisers in 2000-2001. This environmental declaration is based on the figures from 8 of Europe's largest admixture producers and is an average of the superplasticiser types detailed above. The variation between these types and between manufacturers is relatively small in LCA's of concrete, but the figures should not be taken as absolute values for that manufacturer or a superplasticiser type.

ENVIRONMENTAL IMPACT

The figure below reveals how the Eco-profile for superplasticisers fits in a concrete life cycle. This Eco-profile includes processes shown within the dotted line. To complete the life cycle, environmental data from other materials and processes should be added.



ECO-PROFILE SUPERPLASTICISERS

Eco-profile for 1 kg superplasticisers, 30-45% solids

<i>Raw materials - input</i>	<i>Unit</i>	<i>Value</i>
coal, brown	g	82
coal, hard	g	51
crude oil	g	160
natural gas	m3	0.22
<i>Emissions to air</i>		
CO ₂	kg	0.72
CO	g	0.55
NO _x	g	1.8
SO _x	g	3.6
N ₂ O	g	0.067
Methane	g	1.2
Butane	mg	11
Pentane	mg	14
Methanol	mg	60
Ethene	mg	8.9
Benzene	mg	7.4
Non-methane VOC	g	0.29
PAH	µg	39
Acetic acid	mg	63
Ammonia	g	2.1
Arsenic (As)	µg	58
Chromium VI (Cr)	µg	16
Mercury (Hg)	µg	94
Nickel (Ni)	mg	0.46
Vanadium (V)	mg	1.2
Dioxins	ng	43
CFC-10	µg	2.0
CFC-114	µg	1.8
Halon-1211	µg	4.1
Halon-1301	µg	5.0
<i>Emissions to water</i>		
Chemical Oxygen Demand	g	2.6
PAH's	µg	67
Oils, unspecified	g	0.63
Barite	mg	51
Nickel (Ni)	mg	3.9
<i>Emissions to soil</i>		
Chromium VI (Cr)	mg	0.22
Oils, unspecified	g	0.66

Indicators for 1 kg superplasticisers, 30-45% solids

<i>Solid waste</i>	<i>Unit</i>	<i>Value</i>
Non-hazardous waste	g	21
Hazardous waste	g	0.45
<i>Total energy</i>		
Total energy	MJ	18.3

ACCOUNTABLES

The Eco-profile is derived from primary data supplied by EFCA and its member organisations.

An independent consultancy from The Netherlands, INTRON, verified the primary data and computed the Eco-profile.

Additional information for LCA practitioners:

- The Eco-profile on this sheet is valid for admixtures in a range of solids percentages. Even though this percentage may vary substantially it is not a major contributor to the total Eco-profiles and individual admixtures will all be within an acceptable range. The average profile should therefore not be related to the solids percentage of an individual admixture.
- The data collection has been carried out according to ISO 14040 series on Life Cycle Assessment.
- INTRON used literature data on raw material production primarily based upon the Eco-Invent (v1.2) database. Close proximity substitution has been applied.
- Eco-Invent data contain capital goods.
- LCI data for electricity production are based on the European fuel mix.
- Substances that contribute more than 1% to the environmental impact on any of the following environmental categories have been included in the Eco-profile: ADP, GWP, ODP, HTP, TETP, FAETP, POCP, AP and EP.
- The substances in the Eco-profile typically amount to at least 90-95% of the environmental impact in any category.

The membership of EFCA, the European Federation of Concrete Admixture Associations, EFCA, currently consists of the following national associations:

Belgium	FIPAH	Norway	NCCA
France	SYNAD	Spain	ANFAH
Germany	DB	Sweden	SACA
Italy	ASSIAD	Switzerland	FSHBZ
Netherlands	VHB	United Kingdom	CAA

EFCA does its best to ensure that any advice, recommendations or information it may give is accurate. However, no liability or responsibility of any kind (including liability for negligence) is accepted in this respect by EFCA, its staff or members.

Environmental Consultant

INTRON B.V.
Dr Nolenslaan 126, 6136 GV Sittard
Postbus 5187, The Netherlands

For more information please contact:

The EFCA secretary
tel. +44 (0) 1564 77 63 62
fax +44 (0) 1564 77 63 62
www.efca.info or www.admixtures.org.uk