

# Concrete Technology in Focus

## Eco-Efficiency Analysis

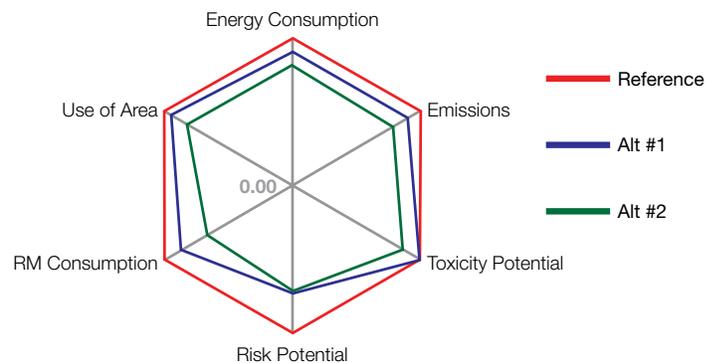
### Overview

An important part of BASF's strategy is to help our customers to be more successful. In response to the many profitability, sustainability and performance challenges our customers face everyday, BASF strives to offer the best, most economical products with the least environmental impact. In 1996, BASF developed the Eco-Efficiency Analysis methodology to evaluate the cost and environmental impacts of alternative products, processes and technologies. To date, BASF has completed more than 400 studies for our own businesses, as well as with customers, suppliers and government agencies.

### Evaluating the Ecological Impact

Eco-Efficiency Analysis evaluates the entire environmental life cycle of a product, beginning with extraction of raw materials through the disposal or recycling of the product. This "ecological analysis" quantifies the environmental impact of a product in six key categories: energy consumption, emissions to air, soil and water, toxicity potential, risk potential, raw material consumption, and land use.

The Eco-Efficiency Analysis analyzes a wealth of detailed information compiled from BASF's in-house records, industry associations and government databases. A result of the analysis is an "ecological fingerprint," shown in Figure 1, that provides a relative environmental comparison of the various alternatives being evaluated compared to a reference. The environmental impact is reduced the closer the ecological fingerprint is to the center zero.



**Figure 1.** "Ecological fingerprint."

# Eco-Efficiency Analysis

## Adding the Economic Impact

Social and statistical weighting factors are used to develop a single value to describe the ecological impact for each product or process. Each of these values is plotted against the total lifetime cost for the alternative derived from the economic component of the Eco-Efficiency Analysis. The most economical and ecological products or processes move directionally toward the upper right quadrant in the Eco-Efficiency Analysis profile.

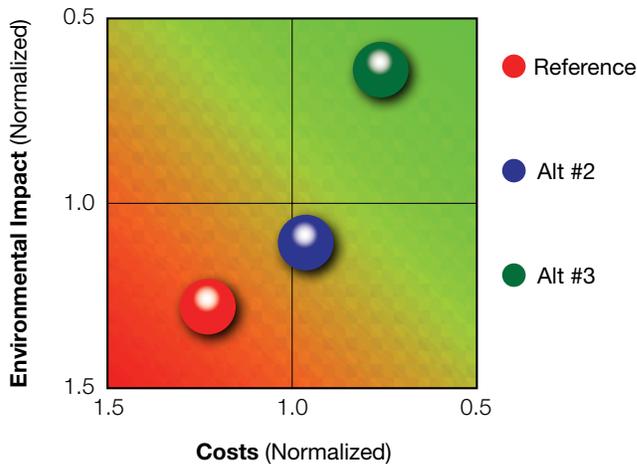


Figure 2: Eco-Efficiency Analysis profile.

## Validation

BASF's Eco-Efficiency Analysis ecological data acquisition and calculations are conducted according to the environmental protocol ISO 14040 and 14044. The Eco-Efficiency Analysis methodology has been third-party validated by the following organizations:

- TÜV Rheinland (certificate number: 5711150561)
  - TÜV appraises, tests and certifies technical equipment and products according to international quality standards and then registers those in compliance.
- NSF International (Protocol P352 - Validation and Verification of Eco-Efficiency Analysis)
  - NSF International, a not-for-profit, non-governmental organization, develops national standards and provides third-party conformity assessment services.

## Green Sense® Concrete Eco-Efficiency Analysis

The Admixture Systems business of BASF has combined Green Sense Concrete technology with a customized interactive Eco-Efficiency Analysis program to create added value for our customers.

Green Sense Concrete is a revolutionary mixture optimization program using supplementary cementitious materials and fillers in combination with specially-formulated MasterGlenium chemical admixtures to achieve new

levels of performance, economics, and sustainability. Up to four optimized concrete mixture proportions can be entered into the Eco-Efficiency Analysis at one time and are then compared to a reference mix. The result is a detailed examination of the environmental life cycle of concrete mixtures beginning with extraction of raw materials through the production of concrete. The Eco-Efficiency Analysis quantifies the ecological and economical impact for each mixture for the six environmental impact categories. The quantifiable results are then compiled into a customized report. The most economical and ecological mixtures move directionally towards the green shaded area, indicating that the concrete has a lower environmental impact and lower cost.

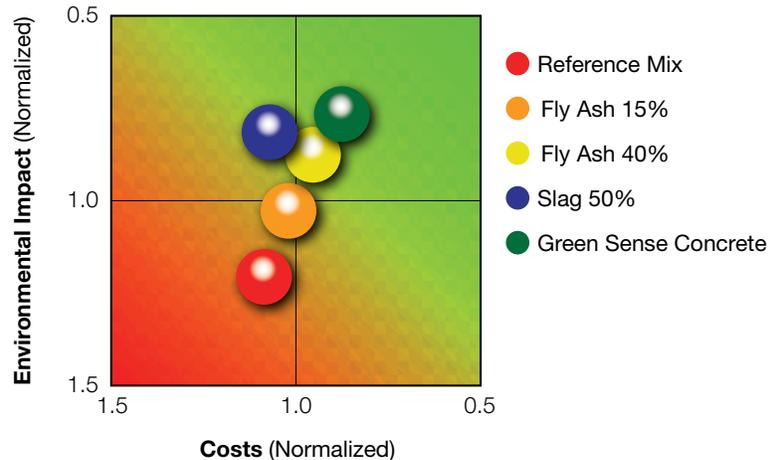


Figure 3: Eco-Efficiency Analysis profile of concrete mixtures.

## More Information

The Master Builders Solutions brand brings all of BASF's expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

The know-how and experience of a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions.

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\*Effective January 1, 2014, the names of BASF's Master Builders Solutions brand products have changed: Glenium became MasterGlenium

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