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DELVO® System Hydration Control: Stabilisation of long haul concrete

The following recommendations refer to one application of DELVO® system technology. Additional applications of the DELVO® system; its use in wet shotcrete, and returned concrete / wash water applications are outlined in the DELVO® system technical data sheet or can be discussed with your BASF representative.

Overview

Concrete is the single most important and widely used construction material in the world today. However, the limits imposed on its usable life by hydration generally confine its use to an area within 1½ hours of a batching plant. In congested city streets this distance can often be restricted to a few kilometres and delay is a continual risk. Delay in transit results in concrete slump loss and an increase in temperature.

This can be especially significant in the summer months or tropical climates when hydration is accelerated due to elevated ambient and material temperatures.

Conventional retarders help to delay set, but cannot control slump or the rate of concrete temperature rise.

Ready-mix producers who have to supply remote sites; to maximum concrete temperature limitations, or are required to transport concrete in congested metropolitan areas have been seeking a cost effective way to deal with these problems and extend their operating areas.
DELVO® system technology enables hydration to be accurately controlled and helps to solve many of the problems associated with transporting concrete over long distances.

DELVO® system

BASF have developed the DELVO® system as a cost-effective alternative for dealing with slump loss and the control of concrete temperature especially on long haul jobs. DELVO® is a two-component chemical system originally developed to control cement hydration so that returned plastic concrete or concrete wash water can be reused or recycled. In some applications, the system can be used to control hydration for periods up to 72 hours.

The system comprises two components, the first, DELVO® Stabiliser, dispensed into freshly batched concrete, stops cement hydration by forming a protective barrier around cementitious particles. This barrier prevents Portland cement, fly ash and granulated slag from achieving initial set. The DELVO® Activator when dispensed into stabilised concrete, breaks down this barrier and allows cement hydration to proceed normally.

Treating ready-mixed concrete

Used to stabilise ready-mixed concrete, DELVO® Stabiliser provides the following benefits:

- Eliminates the need for portable batch plants.
- Extends the service area of ready-mix plants.
- Reduces or eliminates the costs associated with ice and liquid nitrogen used to reduce concrete temperature on projects where a maximum concrete temperature is specified.
- Concrete treated with the DELVO® System results in concrete performance qualities which meet ASTM C-494-86, Type B and D.
- Controls / retains the slump of fresh concrete over extended hauling times.

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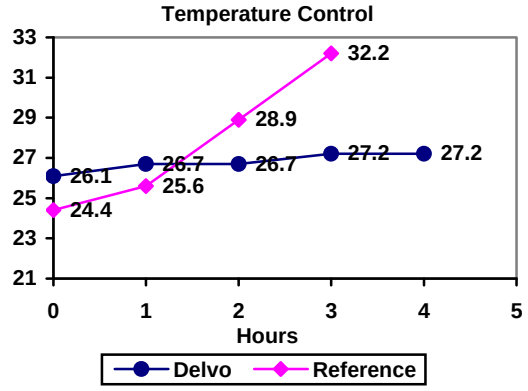
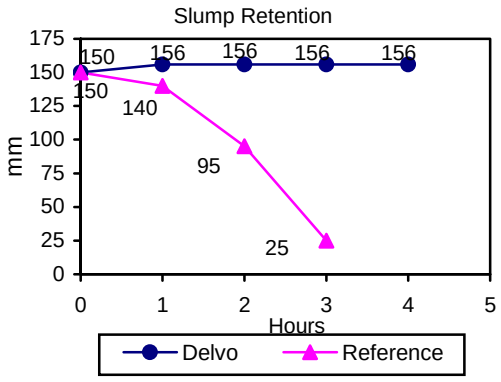
- Controls / reduces concrete temperature rise resulting from hydration over extended hauling times.

The following graphs indicate typical values for control of temperature and slump retention using DELVO® Stabiliser.





The recommended dosage range of the DELVO® Stabiliser is 65 to 1300 ml per 100 kg of Portland cement. In most cases DELVO® Activator is not necessary, however if used, the dosage ranges from 0 to 4880 ml per 100 kg of Portland cement.

The specific dosage for a given concrete mix will depend on chemical admixtures, concrete materials and mix design, the concrete temperature and the stabilisation time required.

The following are guidelines for DELVO® Stabiliser dosages used for long haul stabilisation of ready-mixed concrete. These are only guidelines and variations in materials may cause a change in dosage. Therefore it is recommended that trial batches be made with local materials to determine actual dosages.

Concrete Temp	Hours of additional working time (retardation) ml per 100kg Portland cement					
°C	1	>1-1.5	>1.5-2	>2-2.5	>2.5-3	>3-3.5
38-43	330	390	460	520	590	630
32-37	260	330	390	460	520	590
27-32	200	260	330	390	460	520
21-26	130	200	260	330	390	460
16-21	70	130	200	260	330	390

Note: For each additional ½ hour of working time (retardation) needed past the 3.5 hour limit on the chart, add an additional 65 ml per 100 kg of DELVO® Stabiliser to Portland cement only.

Stabilisation procedure

The procedure for stabilising ready-mixed concrete is simple, but it is important that each step be correctly followed

1. From the batch ticket, identify the mix design and admixtures used.
2. After the fresh concrete is batched, immediately measure and record the concrete temperature.
3. Determine the total amount of Portland cement per cubic metre corresponding to the mix design of the fresh concrete.
   Determine the total DELVO® Stabiliser dosage in ml per cubic metre from the appropriate DELVO® Stabiliser dosage chart [based on the concrete temperature, the total amount of Portland cement, admixtures used, and length of working time (retardation) required].

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4. Calculate the total DELVO® Stabiliser dosage in ml, dispense into the fresh concrete and mix for 7 to 9 minutes at normal mixing speed. This should be completed no later than one-half hour from initial batching.
5. After mixing is completed and the ready mix truck is in transit, its mixing drum must be turning as slowly as possible.

Activation procedure

Note: In general this is not necessary unless the DELVO® Stabiliser has been overdosed

1. Determine and record the concrete temperature.
2. Determine the DELVO® Activator dosage using the DELVO® Activator Dosage Rate Chart and record the total DELVO® Activator dosage in ml.
3. Dispense the required amount of DELVO® Activator into the stabilised concrete and mix for 7 to 9 minutes at normal mixing speed

Standards

DELVO® Stabiliser conforms with the requirements of ASTM C 494-86, CRD C87-86, AASHTO M 194-87I for Type B & D admixture.

Packaging

DELVO® Stabiliser and DELVO® Activator are supplied in 210 litre drums and bulk delivery.

Safety precautions

Safety glasses or goggles and rubber gloves must be worn when handling DELVO® Stabiliser and DELVO® Activator. In case DELVO® Stabiliser or DELVO® Activator come in contact with eyes, skin or clothing, immediately flush with water (for skin, wash with soap and water) for 15 minutes. Remove contaminated clothing and shoes, and wash clothing before reuse. DO NOT take internally. Keep product away from children at all times.

Storage

Store under cover, out of direct sunlight and protect from extremes of temperature. Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice consult BASF's Technical Services Department.

Note

Field service, where provided, does not constitute supervisory responsibility. For additional information contact your local BASF representative.

BASF reserves the right to have the true cause of any difficulty determined by accepted test methods.

Quality and care

All products originating from BASF's Dubai, UAE facility are manufactured under a management system independently certified to conform to the requirements of the quality, environmental and occupational health & safety standards ISO 9001, ISO 14001 and OHSAS 18001.

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BASF Construction Chemicals UAE LLC
P.O. Box 37127, Dubai, UAE
Tel: +971 4 8090800 Fax: +971 4 8851002
www.basf-cc.ae