HYDRAMAX®
FASTER • STRONGER • SMARTER

Hydramax 1006

High Performance, Hydration Enhancing Admixture with High-Range Superplasticiser for Precast Concrete

A state-of-the-art admixture engineered specifically for precast concrete which helps achieve up to 85% hydration(1)

A revolutionary admixture for:

- **Increasing Compressive Strength**
- **Increasing Flexural Strength**
- **Increasing Tensile Strength**
- **Densifying the Concrete Matrix**
- **Reducing Mould Release Time**
- **Reducing Mould Breakage**
- **Enhancing Colour Uniformity**
- **Reducing Efflorescence**
- **Potentially Reducing Cement Content**
- **Increasing Hardness**

And More...

ACIL *A Product of ACIL LTD*

Hydramax® 1006

Hydramax 1006 Technology

Concrete typically hydrates 60 - 70% of cement particles in a concrete mix within a 28-day period. Ultimately, only 70 - 80% of cement may be hydrated over months, or even years.

Hydramax 1006 can hydrate up to 85%[1] of the Portland cement within a shorter period. This unique feature can provide many options and benefits to the precast industry. Although compatible with cement substitutes, Hydramax 1006 will have no effect on these materials. It will only react with Portland cement.

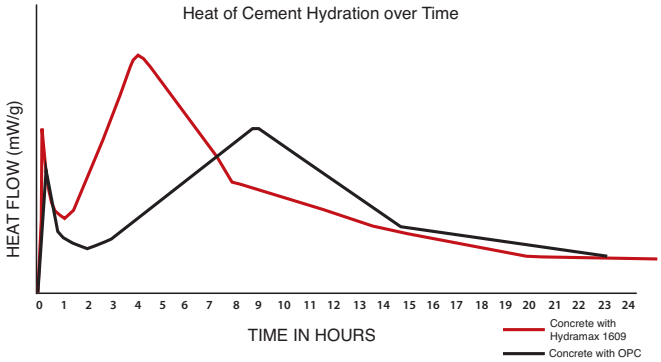
The increased hydration performance is achieved utilising a combination of highly effective compounds, which enhance the efficiency of the Portland cement hydration. Hydramax 1006 is based upon the same principles as Hydramax 1609, but using a non-chloride carrier instead, thus making it compliant with standards that do not accept chloride based additives.

It is a combination of highly effective compounds which accelerate and increase the efficiency of the hydration of Portland cement.

The basis of the technology behind Hydramax 1006 stretches back many decades. Building on this tried and tested technology, Hydramax 1006 has been designed and developed specifically to enhance the performance of products, production processes and environmental benefits for the precast concrete industry.

Hydramax 1006 is a combination of highly effective compounds which accelerate and increase the efficiency of the hydration of Portland cement

resulting in a denser matrix, a more uniform concrete and greater strengths.



Cement Hydration

Hydramax 1006 enables the Portland cement within the mix design to hydrate more particles and provide early, mid-term and ultimate strength gains.

As a worked example of the effects of Hydramax 1006, a mix design with 350 OPC and a 0.5 w/c ratio will have 175 litres of water within it. Of those 175 litres of water, a maximum of 84 litres will typically be used to hydrate the cement. The remaining 91 litres of free water will aid with placement, but also help create pores and bleed tracts within the mass. The 65% (approx.) of cement particles that are hydrated by the 84 litres of water means that there is an actual 'active' water cement ratio of 0.37.

Hydramax 1006 changes this. Assuming that 85% of the 350 OPC is hydrated, then 297.5 kgs of cement is 'activated'. The water content is reduced by 30% to accommodate Hydramax 1006 (therefore only 122.5 litres is within the mix), The 'active' water content is 110 litres.

When comparing the above two 'active' water cement ratios it becomes apparent that, with the mix containing Hydramax 1006, there is in essence very little 'free water' left which is often the cause of troublesome pores and bleed tracts. The significant increase of cement hydration using the Hydramax 1006 also means that there is little to no 'free' calcium hydroxide left within the mix. Calcium hydroxide is still produced, as it is inherently part of the hydration process, but it will be more evenly spread amongst the mass in smaller amounts. These are mechanically bound by the significantly denser matrix; it is this density that gives the precast concrete so many of its performance benefits.

Hydration of the mix containing Hydramax 1006 occurs faster than concrete without, providing early strength gains. However, unlike a simple calcium chloride[3] admixture, Hydramax 1006's unique blend of highly effective compounds ensure that the strength gains continue, potentially achieving 28-day strength within 7 days and, ultimately up to 25% higher compressive strengths[1].

The significant increase in density of the concrete results in increases in flexural and tensile strength. Typically, your flexural/tensile strength is 10% - 15% of your compressive strength. With the use of Hydramax 1006 you can see this being uplifted to 18% of the compressive strength[2].

Hydramax® 1006

A REVOLUTIONARY admixture engineered specifically for precast concrete, which changes the efficiency of the component parts of Portland cement-based concrete during the hydration process to give up to 85%(1) hydration, giving many performance, product and environmental beneifts.

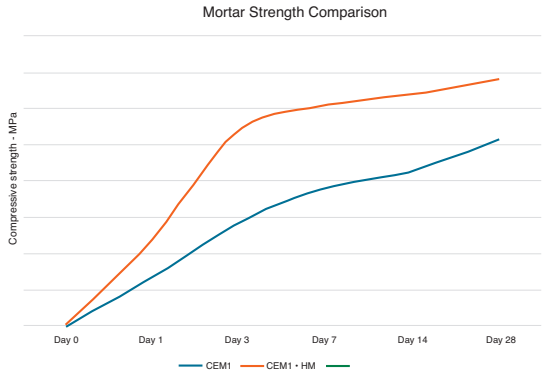
Intended Use

Any precast concrete.

Typical Performance Improvement

Strength

- Early compressive strength
  - Mould striking times significantly reduced(1)
  - 7-day strength in 3 days(1)
  - 28-day strength in 7 days(1)
- Ultimate compressive strength - potentially 25% higher(1)
- Flexural strength - potentially 50% higher(1 & 2)
- Tensile strength - potentially 50% higher(1 & 2)



Shrinkage

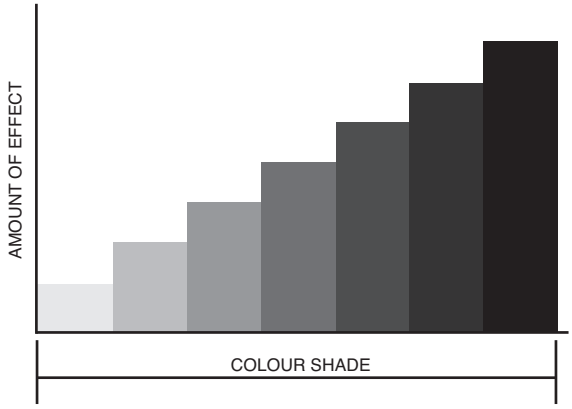
- The more efficient hydration process, and subsequent increase in density of the concrete, means that there is less potential movement of the concrete mass, thus reducing shrinkage and cracking.

Workability

- Works as a 'high range' superplasticiser replacing typically 30% of the water required.
- High flowability.
- Reduced segregation.
- Minimum vibration required.

Colour

- Colour uniformity - more consistent
- Depth of colour - less oxide required, especially with darker colours
- Efflorescence - significant reductions



Durability

- Increased matrix density adds durability. The reduction of free water within the concrete mass helps increase resistance to:
  - Chemical attack
  - Abrasive forces
  - Freeze-thaw attack

Distortion

- The increase in flexural strength of the concrete (resulting from the increase in density) reduces the risk of flat sections of concrete distorting.

Density

- Enhancing the hydration of Portland cement by up to 85%(1), means almost all the water is utilised, therefore reducing porosity and increasing matrix density.

Hydramax® 1006

Product Briefing Summaries

Performance

The characteristics of concrete are dependent on the ingredients used to create it. It is widely recognised that the performance and strength of concrete is defined by the quantity and type of cement, as well as the type of aggregate used.

Hydramax 1006 changes this. With a typical 'standard' concrete, you would expect to see somewhere between 60% and 70% of the cement particles hydrated after a 28-day period. Even after many years, this percentage may only rise to between 70% - 80%. With the inclusion of Hydramax 1006 within the mix design this percentage can rise to 85%(1) in a much shorter time frame.

Architectural Enhancement

Precast concrete elements are often used to provide an aesthetically pleasing finish to a structure. The inclusion of Hydramax 1006 within a mix design can aid in the production of a consistent finish to a precast product, reducing the risk of flaws that can often occur in 'standard' concrete.

Environmental

What if it was possible to significantly reduce the amount of Portland cement in the mix design and achieve the same 28-day strength? With Hydramax 1006 this is possible.

Hydramax 1006 improves the efficacy of the cement hydration process, increasing the amount of Portland cement that is hydrated at 28 days from typically 60 - 70%, to 85%(1).

This performance benefit potentially allows a reduction of approximately 20% of the OPC specified within a concrete mix design.

Commercial Benefits

Aside from the many performance benefits to concrete that Hydramax 1006 can provide, it can also provide many commercial benefits to include:

- Reduction in materials.
- Reduction in time.
- Increase in production.
- Reduction in product rejections.

Production

The early strength gains detailed in the "Technical Note - Performance" document give additional benefits other than simply having stronger, harder, denser concrete. Depending on the facility, benefits can include:

- Increased output
- Less storage space required
- Less product failures

Durability

The addition of Hydramax 1006 to a concrete mix design can significantly aid the durability of the concrete. Hydramax 1006 cannot eliminate the complete effect aggressive chemicals may have upon the concrete, but the manner in which it changes the structure of the concrete helps limit the extent of degradation the aggressive chemicals can generate.

For more detailed information on these subjects please see the Hydramax 1006 individual Technical Note documents.

1) Based on a Hydramax 1006 dosage rate of 2.5% of OPC by weight, added to a comparable mix containing no admixtures.

(2) For a 30 MPa concrete: Estimate for tensile/flexural strengths: 30 x 0.15 = 4.5 MPa. With Hydramax 1006 added to the same 30 MPa design, compressive strength increases by 25% (30 x 1.25 = 37.5 MPa). The corresponding tensile/flexural strengths increase by ≈50% (4.5 x 1.50 = 6.75 MPa). The comparative compressive strength to tensile/flexural strength ratio is 18% for the mix containing Hydramax 1006, compared to 15% for the mix not containing Hydramax 1006 (6.75 MPa/37.5 MPa = 18% v's 4.5 MPa/30 MPa = 15%).