

CarbonCure™ Concrete Additive

Product Description

CarbonCure Technologies offers a technology to implement carbon dioxide (CO₂) utilization in the ready mix concrete industry. Waste CO₂ can be put to a beneficial use as a feedstock in the production of concrete. The retrofit CarbonCure™ Ready Mix Technology adds CO₂ to concrete during mixing. The CO₂ reacts with the cement and is mineralized to produce nanoscale calcium carbonate. The carbonate formation can impart positive impacts on the concrete. The CO₂ addition (hereafter, CarbonCure) can improve hydration and increase compressive strength without affecting the fresh concrete properties.

Uses

CarbonCure is used to produce concrete mixes with higher compressive strength. CarbonCure is suitable for normal weight and light weight concrete in ready-mix applications. Concrete shall be designed in accordance with *Standard Recommended Practice for Selecting Proportions for Concrete, ACI 211*.

Benefits

The addition of CarbonCure to concrete mixes can realize benefits including:

- Ability to improve both-early and late-age compressive strengths
- Reduced variability of compressive strengths
- Optimized binder designs
- Concrete produced with reduced carbon footprint

Guidelines for Use

Dosage Rates: CarbonCure has a recommended dosage rate of 0.8 – 4.0 fl oz/cwt (50 – 250 g/100 kg) of cement (as distinct from total cementitious) for most applications. Dosages outside this range may be used if local testing shows acceptable performance. Pretesting is required to determine the appropriate addition rate for desired performance. The optimum addition rate may be influenced by other concrete mixture components, cement types, ambient temperature, mineral additives, quality and gradations of aggregates, slump of concrete, mixing equipment, job conditions, and desired performance characteristics

Mixing: The optimum performance of the CarbonCure is generally obtained with a delayed addition following the start of mixing.

Packaging and handling

CO₂ is available in bulk and delivered by tanker truck to an on-site pressurized storage tank for dispensing by means of the CO₂ metering equipment.

CO₂ must have a certified purity of 99% or above for use in this application – certification of CO₂ purity compliance shall be made available upon request. CO₂ safety and handling information can be found in Carbon Dioxide safety data sheet CAS No: 124-38-9.

Dispensing Equipment

CarbonCure is dispensed from a storage tank of liquid CO₂ in communication with the dispensing control system. The tank and CO₂ are sourced from a local industrial gas supplier. The tank capacity is determined according to the usage and gas supplier recommendation. The dispensing control system is connected to the batching system and the CO₂ addition is fully integrated into the batch sequencing of materials that are added to the mix.

Performance Characteristics

Fresh properties

An optimal dose of CarbonCure does not impact concrete workability or air content. Producer data for production on a single mix design is presented for slump (**Figure 1**) and air content (**Figure 2**). The CarbonCure production data is presented against control limits for the mix when made without CO₂. The average metric and variability of the fresh properties of the concrete made with CarbonCure was comparable to and consistent with the reference production.

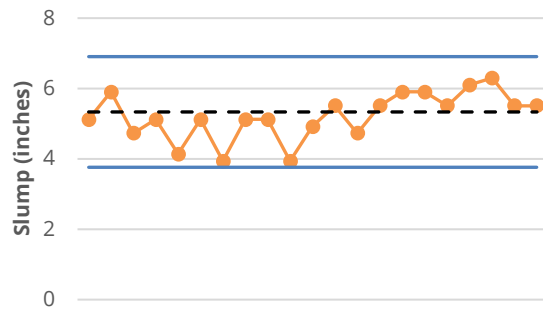


Figure 1: Slump comparison

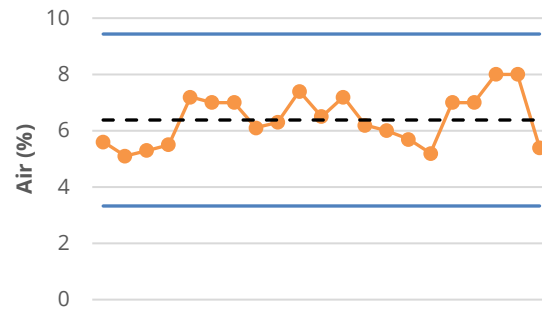


Figure 1: Air comparison

Compressive Strength

An optimal dose of CarbonCure can improve the compressive strength of the concrete at both early and late ages. Industrial strength data of concrete produced with two different CarbonCure dosages is presented in **Figure 3**.

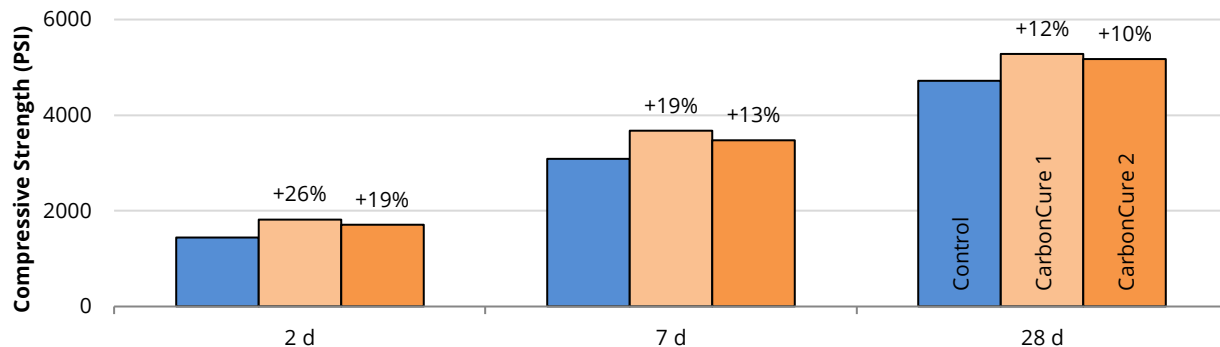


Figure 2: Compressive strength field data

Compatibility

CarbonCure is compatible with most admixtures used in the production of quality concrete, including normal, mid-range and high-range water-reducing admixtures, accelerators, retarders, extended set control admixtures, air-entrainers, corrosion inhibitors, and shrinkage reducers.

Comment on Concrete pH

The reaction of atmospheric carbon dioxide with hydrated cement paste over time is acknowledged to consume calcium hydroxide and thereby reduce pore solution pH. Testing of the pore solution of concrete produced with CarbonCure was conducted at 28 days (Figure 4). The extracted pore solution was not affected by the CO₂ addition. The action of CO₂ in the earliest stages of hydration neither prevents nor impairs the later development of pore solution alkalinity.

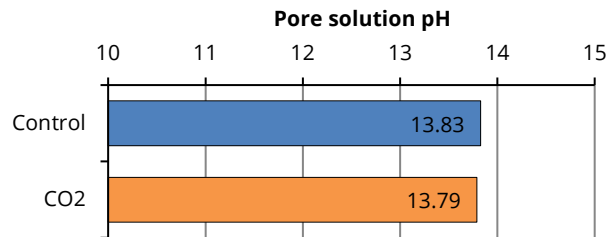


Figure 3: Pore solution pH measurement

Related Documents

See MSDS for carbon dioxide as provided by the industrial gas supply partner.

NOTE

Continuous testing by the concrete producer is strongly recommended. Since all cements and other concrete-making materials differ from source to source, and can vary over time, ongoing testing by the concrete producer is recommended for optimum CO₂ system performance, especially when changes are made to the materials or batch sequencing. Accurate concrete performance assessments require adequate quality control practices. The CO₂ injection system performance is supported through following all recommended maintenance practices, procedures and schedules.



The information provided herein is intended to be a guide developed upon data, practices and knowledge considered to be true and accurate. The information is offered for the user's consideration, investigation and verification, but results are not warranted to be obtained. Satisfactory results depend not only upon quality materials

and many other factors beyond our control. Therefore, CARBONCURE MAKES NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, RESPECTING CARBONCURE TECHNOLOGY, CARBONCURE PRODUCTS AND CARBONCURE SERVICES AND CARBONCURE SHALL HAVE NO LIABILITY WITH RESPECT THERETO. User shall determine the suitability of the technology for the intended use and assume all risks and liability in connection therewith. The information is subject to change without notice. No statement, recommendation, or suggestion is intended for any use that would infringe any patent, copyright, or other third party right. CARBONCURE SHALL NOT BE RESPONSIBLE FOR CONSEQUENTIAL, INDIRECT OR INCIDENTAL DAMAGES (INCLUDING LOSS OF PROFITS) OF ANY KIND. CarbonCure reserves the right to make any changes according to technological progress or further developments. CARBONCURE and CO2CRETE are trademarks, which may be registered in the United States and/or other countries, of CarbonCure Technologies Inc.

© Copyright 2020 CarbonCure Technologies Inc. All rights reserved.