

Local Solutions that
provide utmost *concrete care!*



Our Solutions include:

- ✓ Concrete & Mortar Admixtures
- ✓ Concrete Repair & Protection
- ✓ Dry Mortars
- ✓ Waterproofing Solutions
- ✓ Flooring Systems
- ✓ Tile Adhesives & Grouts
- ✓ Green Building Materials
- ✓ Precision and Cable Grouts
- ✓ Tunneling and Underground Construction



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United Arab Emirates | Qatar | Oman | Iraq | Jordan | Lebanon



*Environmentally Intelligent
Waterproofing and Corrosion
Control for Concrete*





Michel Nacheff: Managing Director

Holds a Master degree in BA, from University of Leicester (UK) and a Bachelor degree in Civil Engineering from the American University of Beirut. Having more than 26 years of experience in the Gulf and MENA regions, with companies like CCC, Holcim, degussa and BASF.



Soren Thompson: Director of Int'l Sales

Holds a BA from Princeton University. Soren is the Director of International Business for Hycrete Inc. since 2010. Prior to 2010, he was an Analyst responsible for special projects in the areas of international expansion, US government projects, marketing & product development. Soren was a member of the US Olympic Fencing Teams, placing 7th in 2004, & is a 2012 World Fencing Team Champion.



Concrete protection solution:

The role of new generation admixtures and other construction chemical systems in reducing Carbon Footprint



PAC
Technologies



Wednesday 10th Dec, 2014

Contents:

1. Quick Company Overview
2. Using Hycrete admixtures as a total waterproofing solution
3. Our approach for concrete durability and sustainable construction



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The Hycrete logo features the word "Hycrete" in a bold, black, sans-serif font. To the left of the text is a stylized graphic consisting of two overlapping, curved lines in shades of blue and grey, resembling a swoosh or a partial circle.

Hycrete

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Hycrete

who said beauty is skin deep?

PACTORep by PAC TECHNOLOGIES,
repairs concrete inside out.



ALL KINDS OF REPAIRS SUCH AS:

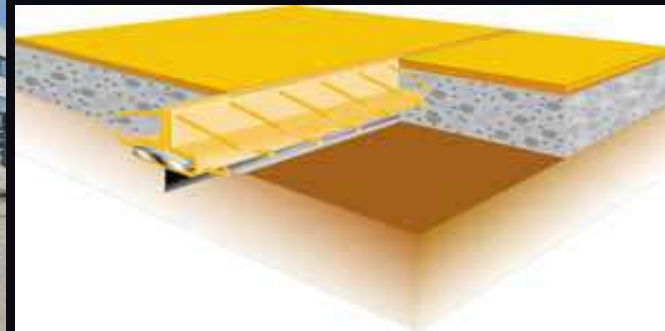
- ✓ High build repairs
- ✓ High strength repairs
(including microsilica and fibers)
- ✓ Special repairs with corrosion inhibitors
(for severe exposures)
- ✓ Fairing coats
- ✓ Cosmetic repairs
- ✓ Colored repairs
- ✓ Epoxy and PU
- ✓ Crack injection products and techniques
- ✓ Pourable repairs/micro concrete
(for column repairs)
- ✓ Restoration repairs
- ✓ Bedding mortars
- ✓ Rust removal
- ✓ Water plugs
- ✓ Under water repairs

- PAC Technologies is an LLC company established in Dubai in 2007, as a manufacturing company with focus on quality of services, operating in the field of Construction Chemicals.
- ISO 9001-2008 certified.
- All products tested by 3rd parties laboratories as per BS EN or ASTM standards.
- Present in UAE, Qatar, Oman, Iraq, and soon in other countries in the region.

Company overview



- In addition to the products and systems the company produces in Dubai, PAC represents and cooperate with many international reputable companies leaders in their field such as :
 - **Holcim** – France (for micro fine cement, grouts and underground injection techniques)
 - **Fabrino** – Germany (for colored aggregates and surface retarders for Precast industry)
 - **Stock Big** - Germany (for spray plaster machines)
 - **Boss accumetric** – USA (for sealants)
 - **Rocland** – France (for dry shake floor hardners)
 - **Hycrete**- USA (for waterproofing concrete/corrosion inhibitors)



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Hycrete



Delivering Concrete Solutions



Membrane-Free Construction & Corrosion Protection

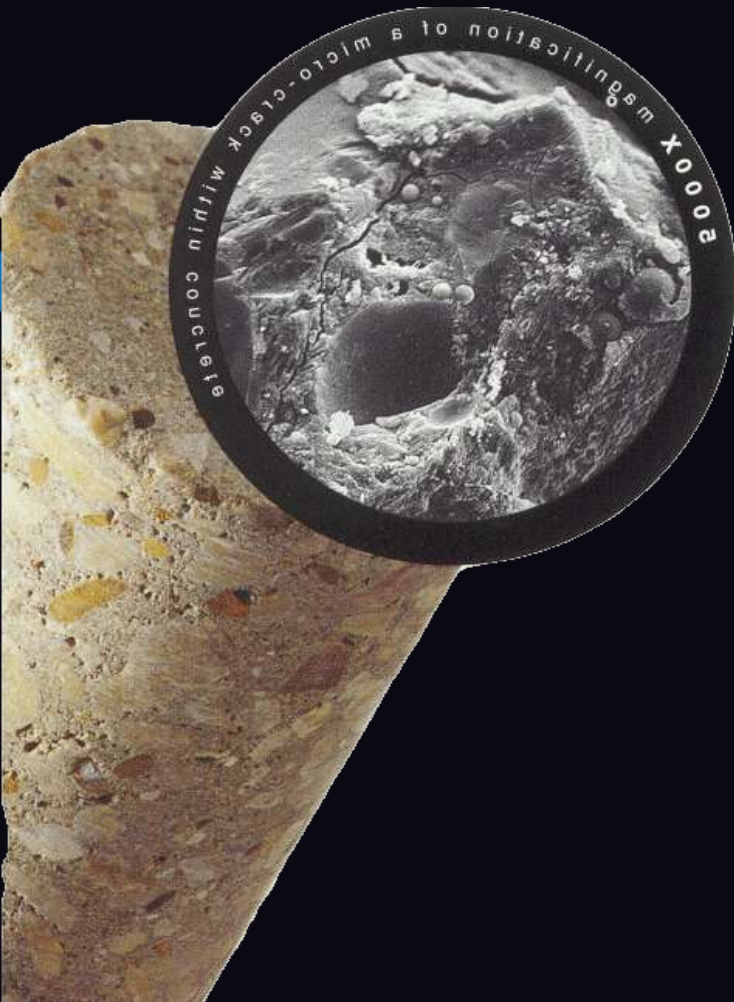
Introduction to Hycrete



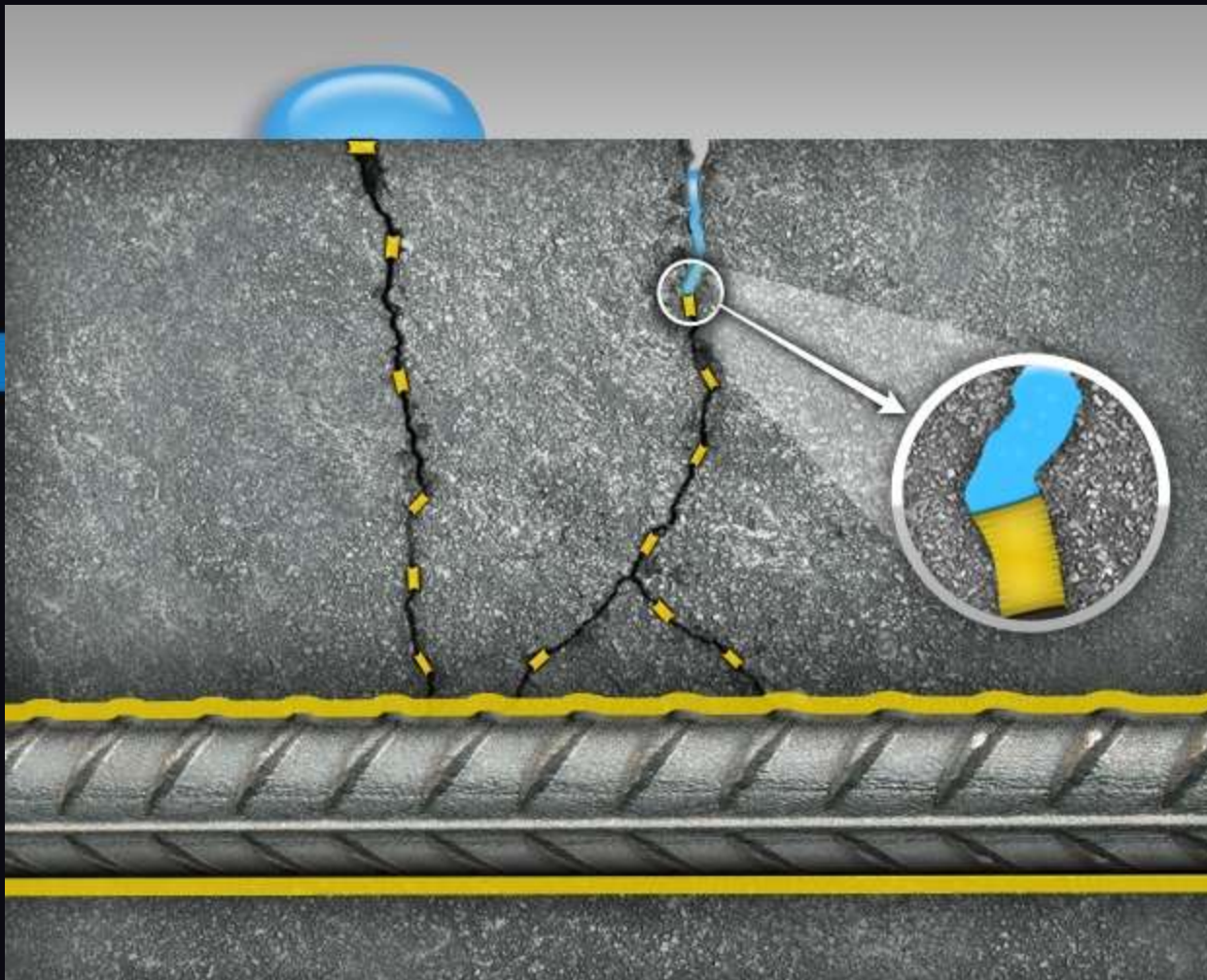
Concrete: Addressing two major issues

1. It's a
Hard Sponge

2. It's Vulnerable
to Corrosion



Hycrete Blocks Pores & Protects Rebar



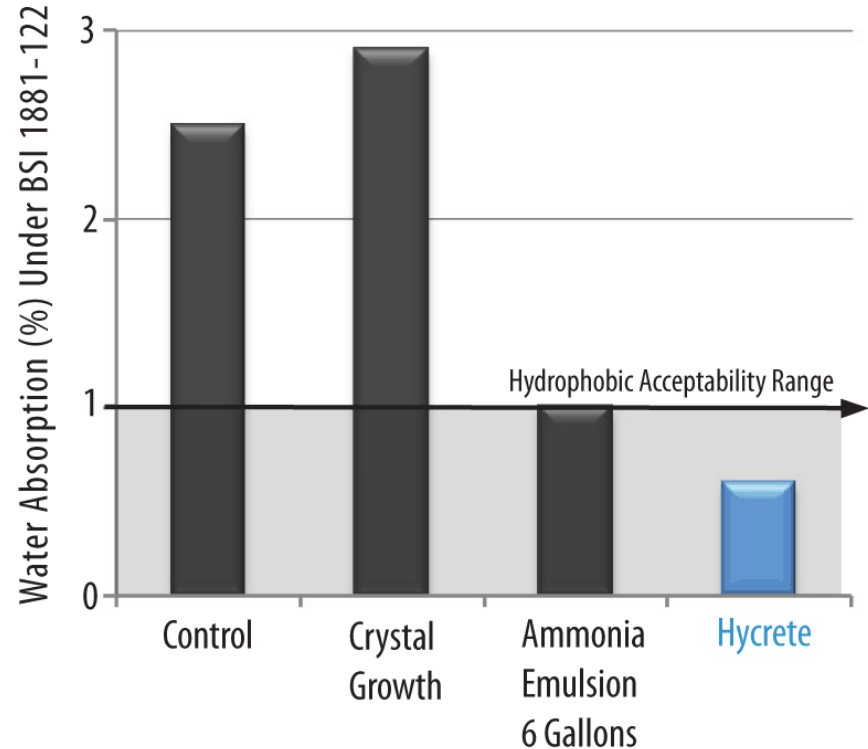
Water repellent
Nano-molecule
polymers block
pores

Anti-corrosive
passivating layer
on the surface of
steel

Hycrete Keeps Water Out of Concrete



High dosage for visual emphasis



South Carolina Independent Lab Testing: 40/60 Structural Mix, 0.40 W/C - 611 Type I-II Cement Polycarboxylate Superplasticizer



Delivering Concrete Solutions



Hycrete, Inc. was named one of the leading 100 technology pioneers by the World Economic Forum in 2008.



Hycrete Inc.'s CEO, was one of seven clean tech leaders invited to meet with President Obama to discuss sustainability.



Hycrete, Inc. was named by Time Magazine as one of four companies leading the fight to win the war on global warming



Which Looks Like Greener Construction to You?

Membranes



External Protection Problems:



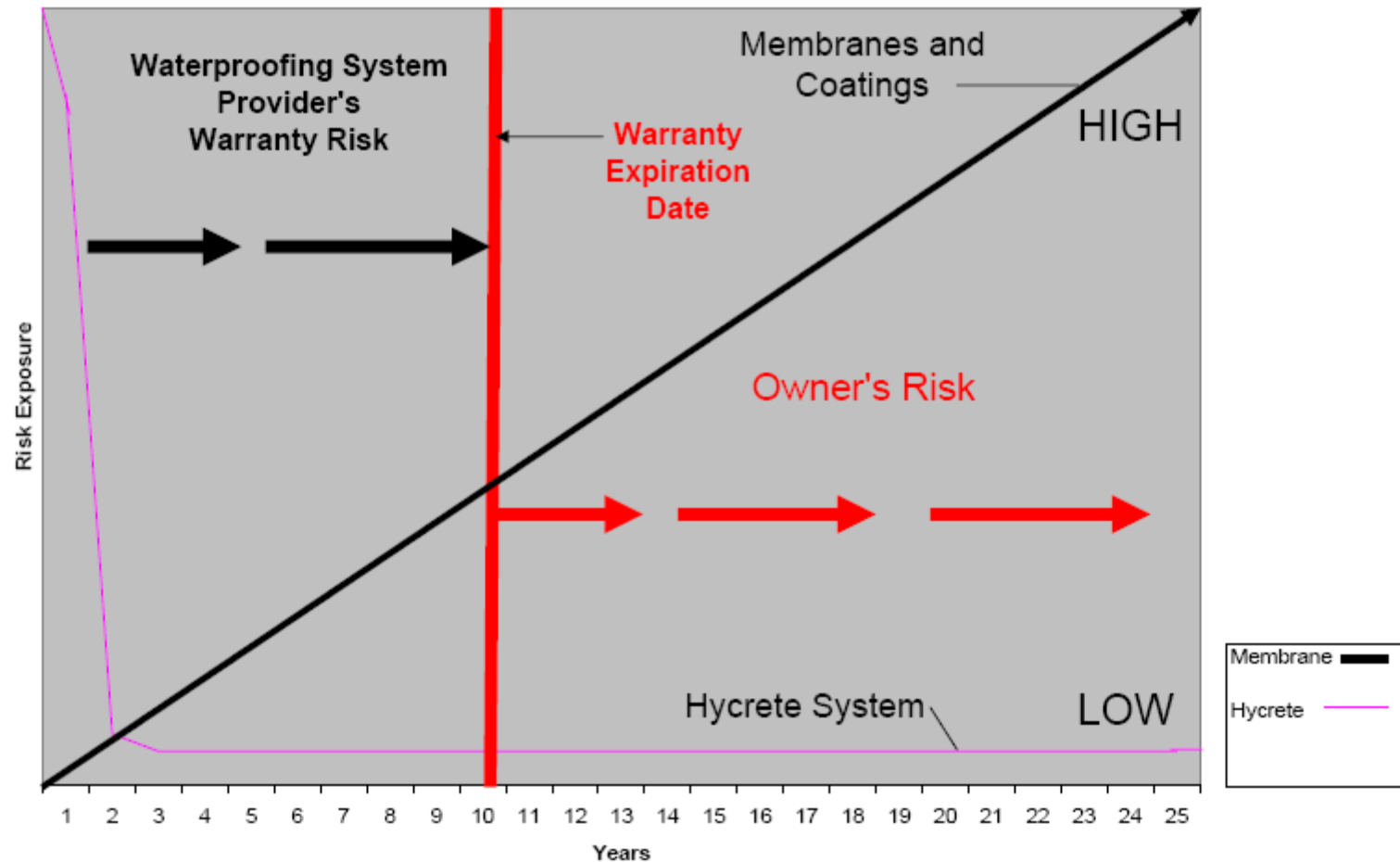
- Requires 100% perfect workmanship
- Risk of weather delay
- Vulnerable to damage
- Expensive or impossible to repair (finger pointing when leaks occur)
- Typically not recyclable
- High VOC, safety issues



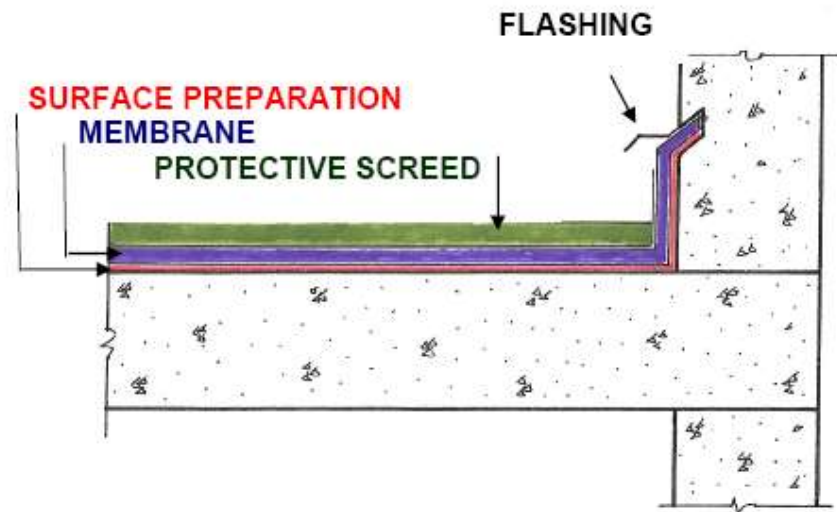
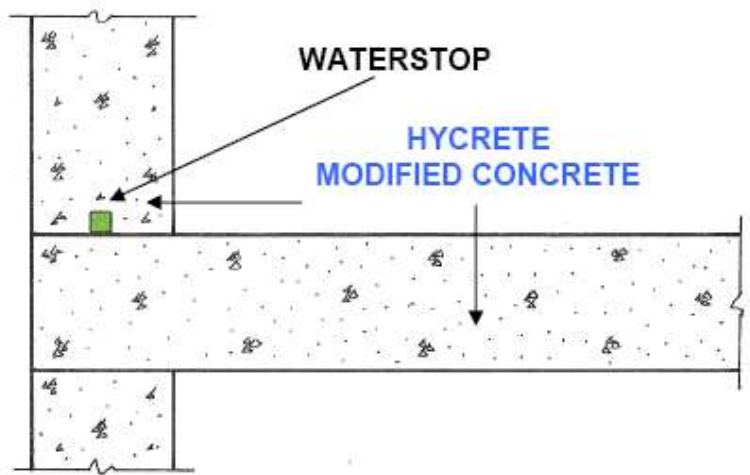
Delivering Concrete Solutions

Hycrete – Comparative risk profile

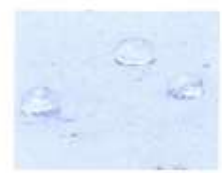
Warranty Risk Comparison



Hycrete vs. Membranes



- *30%-50% LESS EXPENSIVE THAN MEMBRANE
- *DECK IS WATERPROOF AS SOON AS THE CONCRETE IS CAST.
- *ENTIRE DECK IS WATERPROOF
- *PROTECTIVE SCREED IS NOT REQUIRED AS IT IS TRAFFICABLE.
- *EASILY REPAIRED FROM BELOW OR ABOVE.
- *10 YEAR PERFORMANCE BASED WARRANTY



- *TIME CONSUMING
 - CURING OF CONCRETE
 - SURFACE PREPARATION
 - INSTALLATION OF MEMBRANE
 - INSTALLATION OF PROTECTIVE SCREED
- * DIFFICULT TO LOCATE LEAKS AND REPAIR

Leaks in damaged membranes covered by a protective topping are difficult to locate without removal of the protective screed.
- *COSTLY REPAIR

Removal of the entire protective screed, re-installation of the membrane and topping slab are required.
- *LIMITED WARRANTY

Simple Solution Move \$16 Billion from...



Directly To The Concrete



CO2 savings: Example—10,000 sq mtr slab; 3mtr walls; 30cm thick (3,360 m³)

Business as usual

Type 1 – primer, 2-layer membrane, flexible flashing, joint cover sheet, 2 step sealant

Type 2 – primer, membrane, tie-back covers, liquid membrane, rolled edges/corners, sealant after framework removal

CO₂ emissions: 24 metric tons

Hycrete technology

5 liters per cubic meter Hycrete
High strength mix design
GGBS and/or FA
Superplasticizer
Low w/c – 0.36 – 0.38
waterstops

CO₂ emissions: 46.94 kgs

***CO₂ savings: 23.95 mt
or 99.8% reduction***



Water

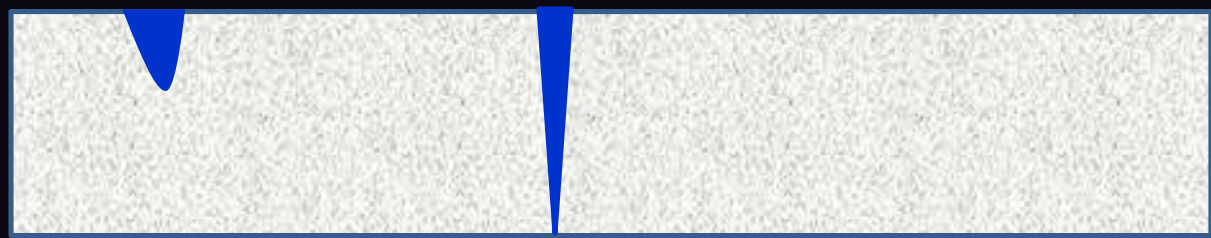
Normal concrete



Water pooling behind paint

Water

Hycrite treated concrete



Water

No leaking through concrete, leaks only occur where there is a crack through the entire thickness of the concrete



- blind side membrane failure
- source of the leaks unknown
- massive injection program



The Palm Jumeirah - Dubai



Palm Jumeirah

Blindside



Parking Deck



Hycrete Protects the steel from corrosion



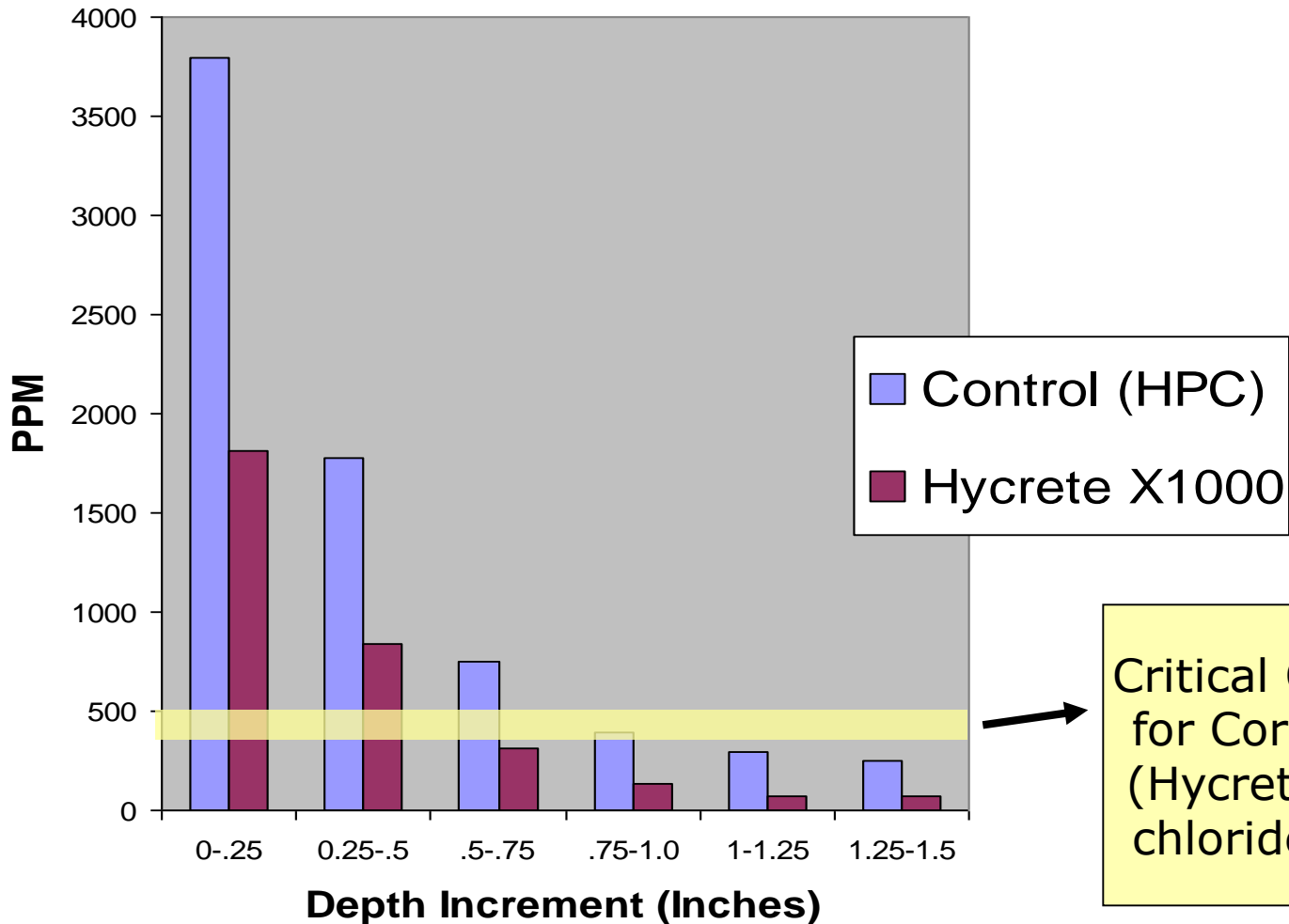
Hycrete added : No corrosion

No Hycrete: see corrosion

See date:
13-8-2014

NJ DOT US Route 130 Tests (3.5 yrs service)

Chloride Content



Critical Chloride Content for Corrosion Initiation (Hycrete: **2-3.5x less** chlorides than control)

Green Savings Delivered to TJ School of Law

THOMAS JEFFERSON
SCHOOL OF LAW
SAN DIEGO, CALIFORNIA



Project

University classroom building located in downtown San Diego, CA.

Team

Owner:	TJ Law School
General Contractor:	Bovis Lend Lease
Architect:	Fehlman-LaBarre
Engineer:	Hope Engineering
Ready Mix Provider:	Hanson
Concrete Contractor:	JT Wimsatt
Waterpr. Consultant:	Deihl Group

Waterproofing Challenges

- Mission of greenest building possible.
- Below-grade shotcrete without worry about a compromised membrane against lagging.

All With A Greener Solution

Environmental Impact

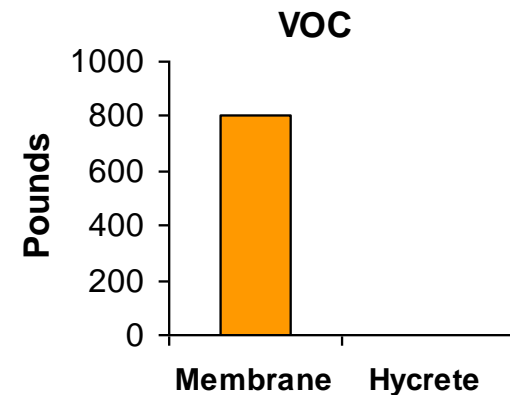
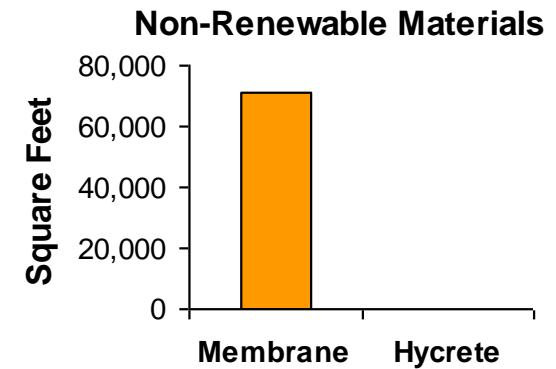
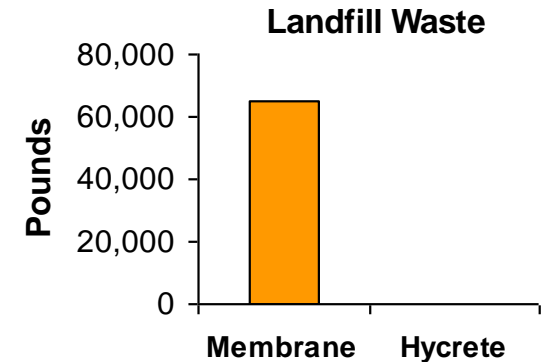
Use of Hycrete eliminates the following:

VOC	799 pounds
Asphalt	64,728 pounds
Non-Renewable Materials	71,122 square feet
Polymers	0 pounds
Toluene	0 pounds
Petroleum Lubricating Oil Base	0 pounds
Chlorobenzotriflouride	0 pounds
Paraffinic	0 pounds
Rubber/Latex	0 pounds
Man Hours	576 hours
Landfill waste	64,728 pounds
Concrete re-used **	1,667 tons

** Hycrete, by eliminating adhered membranes, makes concrete easier and more practical to recycle. In some jurisdictions, Hycrete will be the factor that allows recycling.



CONFIDENTIAL



Slide 27

Hycrete Eliminates De-Watering Pumps

Pumps eliminated:	8
Power per pump:	24,177 kWh per year
Lbs. CO ₂ per kWh:	1.34
Annual savings:	129 tons of CO ₂
Building life:	30 years
Total savings:	Almost 4,000 tons CO ₂

LEED Contributions: The Greenest Product



Points Available Solely from Hycrete Use

Innovation and Design – “Membrane-Free Construction”

Use of Hycrete has qualified for a stand-alone credit, and may for your site, as well

Categories Hycrete Can Contribute To:

MR 2.1 – Construction Waste Management

Hycrete has zero construction site waste, eliminating the waste streams from traditional membranes.

MR 4.1/2 – Recycled Materials

Hycrete contains 80% pre-consumer recycled materials.

Innovation and Design – 2.5% of Bldg Mat’ls Cradle to Cradle

An ID point can be achieved for a total of 2.5% of a building’s material use certified Cradle to Cradle. Hycrete is rated Cradle to Cradle Silver.



Summary-Environmental Benefits



- Cradle to Cradle Certified
- LEED points
- Reduce landfill
- Keep Concrete Sustainable
- Eliminate VOCs
- Enhance Durability
- “Do More With Less”



SUMMARY RESULTS



3.0 Water absorption Comparison of tests result (Control Specimen & Test Specimen)

Test method: BS 1881: Part 122: 1983

Test reference	Control Mix			Test mix - (2.5 Liter) Hycrete X1000C (Concentrate)		
	1	2	3	1	2	3
Sample reference						
Test results (% by weight)	4.1	4.3	4.1	0.8	0.8	0.9
Average test results (% by weight)	4.2			0.8		
Percentage of water reduction				81		

3.0 Water absorption Comparison of tests result (Control Specimen & Test Specimen)

Test method: BS 1881: Part 122: 1983

Test reference	Control Mix			Test mix - (5.0 Liter) Hycrete X1000C (Concentrate)		
	1	2	3	1	2	3
Sample reference						
Test results (% by weight)	4.1	4.3	4.1	0.5	0.6	0.5
Average test results (% by weight)	4.2			0.5		
Percentage of water reduction				88		

3.0 Water absorption Comparison of tests result (Control Specimen & Test Specimen)

Test method: BS 1881: Part 122: 1983

Test reference	Control Mix			Test mix - (7.5 Liter) Hycrete X1000C (Concentrate)		
	1	2	3	1	2	3
Sample reference						
Test results (% by weight)	4.1	4.3	4.1	0.4	0.4	0.4
Average test results (% by weight)	4.2			0.4		
Percentage of water reduction				90		

Hycrete : Conclusion

- Every consultant/client has an approach
- APP and SBS membrane still preferred
- How far would you go to protect your structure, and the liabilities
- Option 1: Use membrane as the first line of defense, but use Hycrete admixture as your safety net (at low dosage of 2.5 ltr/m³)
- Option 2: Stand alone waterproofing at 2.5 to 5 ltrs/m³.
- Option 3: Maximum corrosion and waterproofing for aggressive environments (remove membrane and use Hycrete @ 5 to 7.5 ltr).

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Our Approach to Green Concrete

- Sustainability and resource efficiency are key topics in the concrete industry today, since cement industry is responsible for about 5% of the global carbon emissions and concrete production uses large amounts of water and aggregates.
- Carbon footprint is a concern for concrete producers, and the construction companies on their sites.
- The efforts and the methods should be combined for better results



Water:

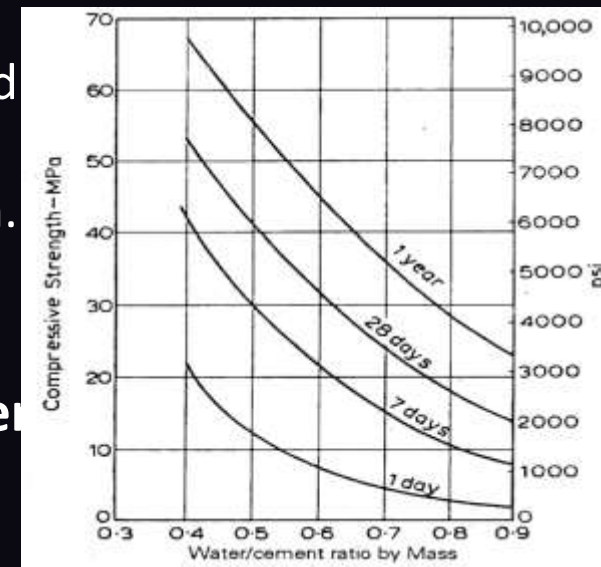
why it is an important factor in reducing the Carbon Foot print in the construction industry?

- Required to react and hydrate cement and cementitious materials.
- Required to give workability
- Water / Cement Ratio



Our Approach to Green Concrete

- We all know that a concrete with 350 kg of cement and a w/c of 0.34 has a better performance than a concrete with 500 kg of cement and a w/c of 0.50.
- Cement & Cementitious Materials require a W/Cm of only around 0.18 to 0.23 for hydration, the remainder or the water added is required just to give workability.
- A high percentage of the extra water remains in the cementitious paste forming voids and capillaries, therefore creating more porosity. Hence the more water added above that required for hydration leads to a weaker, less dense cementitious structure reducing strength.
- **They key is to reduce W/C ratio, while keeping concrete workable for a long duration, together with using the “internal waterproofing” approach**



How to do that?

Various types of Admixtures

<u>Type of Admixture</u>	<u>Typical Dosage/c.weight</u>	<u>Water reduction</u>
Lignosulfonate (MLS)	0.2 - 0.8	< 10
Naphtalene Sulfonate (BNS)	0.8 - 1.5	< 26
<u>Polycarboxylic ether (PCE)</u>	0.5 - 1.3	> 40



PC based admixtures: effect on CO2 emissions

1. Polycarboxylate admixtures can reduce water cement ratio by more than 40%, compared to other admixtures
 2. The raw materials of PC admixtures are now being produced based on by-products from renewable raw materials instead of oil, without compromising the quality.
- Benefits of using PC based admixtures:
 - Water reduction (natural resources)
 - Cement reduction (carbon foot print)
 - Less CO2 in the manufacturing process compared to PNS and LS
 - Less trucks movement (lower dose/m³)
 - **Self compacting concrete**

Why using SCC reduces the carbon foot print?

- Problem?

Quality of concrete is greatly affected by the inadequate compaction, as full compaction is very hard to achieve in real life on site.



- Solution?

Design the concrete mix so that **no** external compaction is required !

- Result?

Massive impact on quality, savings & CO2 emission



Benefits of SCC

- No vibrating equipment
- Reduces noise
- Early completion/speed of construction /Speeds placing
- Enhanced durability requirements
- Reduces placing costs
- Excellent surface finish
- Reduced remedial work and repairs
- Improved life of formwork
- High ultimate strength
- Reduced permeability of in-situ concrete
- Design benefits on elements size
- Reduced labor force

Effect on Carbon foot print

- Less power used, less labors
- Cleaner environment
- Less manpower
- Extension of life cycle, landfills reduction
- Reduces placing costs
- Less repairs
- Less cement
- Less consumption of forms
- Reduced elements size, less cement
- Less cracks, repairs, etc.
- Reduced elements size, less cement
- Reduced labor force

Is SCC used as it should in the UAE?

- Only in particular cases
- Human nature resists change !
- Needs particular and professional readymix producers.
- Cost factor/m³ of concrete, while we should be looking at overall cost/structure.
(Cost of Concrete: 25% more- Concrete+Labour+Plant: 11.5% less)
- Used in Precast application and result in early demoulding, less energy used (no/less steam curing), double casting, less repairs.
(see next slide)
- PC production trend is on the hike, but did not yet reach the level of naphthalene based admixtures.
(approx. 50% PNS, 20% LS and 30% PC)







Summary



On January 15, 2012, HH Sheikh Mohammed Bin Rashid Al Maktoum, Vice-President & Prime Minister of the UAE announced a long-term national initiative to build a green economy in the UAE under the theme 'A green economy for sustainable development'.

A direct implementation of this decision was applying the specifications of green buildings to all the buildings and premises in Dubai.



Our Approach:

Waterproofers: Hycrete W1000

- Eliminate/Reduce membranes
- Reduce massively CO2 emissions
- Reduce landfills

Self Compacting Concrete

- Reduce noise
- Reduce vibrators
- Improve life of formworks
- Reduce workmanship
- More durable concrete

Green Concrete

Corrosion Inhibitors:

Hycrete W1000

- Enhancing life cycle of structures
- Reduce repairs

Cement replacement

- Less Carbon footprint

PC based Admixtures:

- Less vehicle movement
- Less CO2 emission
- Reduce Water usage
- Reduce Cement usage

Let us keep the UAE and Dubai a clean and beautiful city



Joint Responsibility



For more info, pls visit our websites

www.hycrete.com



LATEST NEWS PAC Technologies launches new website

who said beauty is skin deep?



PACTORep[®] by PAC TECHNOLOGIES, repairs concrete inside out.

About us Our Systems Partners Projects CSR Media

Welcome to PAC Technologies

PAC Technologies llc was established in Dubai in July 2007, with very clear objectives: To provide not only high quality construction chemicals, but most of all, a superior and more personalized quality of services.

PAC Technologies comprises of manufacturing plants for liquid, powder and resin production. These production lines are supported by dedicated laboratories and R&D centers for each line, where

Admixtures



Projects



www.pactechnologies.ae



BEHIND EVERY GREAT CONCRETE
THERE'S A GREAT CHEMISTRY

Thank you

