

Hi-Tech Concrete Products LLC, Abu Dhabi, UAE

# Heating Concrete in the Desert

In 2015, one of the leading producers of precast concrete products in the United Arab Emirates, Hi-Tech Concrete Products, installed a ThermalCure Accelerated Concrete Curing System from Kraft Curing Systems. The system produces and circulates hot water to heat the precast concrete and provides for high early strengths for shortened hardening durations. Two years after installation, this case study examines who is Hitech Concrete Products and did the investment make sense.

## A Leading Development & Construction Company

The combination of an increasing population and the growth in tourism in the UAE has led to the emergence of some of the world's fastest growing real estate development and con-

struction companies. This includes Hi-Tech Concrete Products, a subsidiary of Trojan Holdings LLC and a part of the Royal Group of companies.

## Precast Concrete Production - A Key to Success

Hi-Tech Concrete Products is a leading manufacturer of precast concrete products, blocks and block paving and one of eight companies operating under the Trojan Holding umbrella. Formed in 2006 with a facility equal to 120,000 sq. meters, Hi-Tech supplies high quality, innovative and customized precast concrete solutions while undertaking design and build contracts utilizing and highlighting the quality, accuracy, consistency and speed advantages of precast concrete components in order to convert traditional in-situ projects.



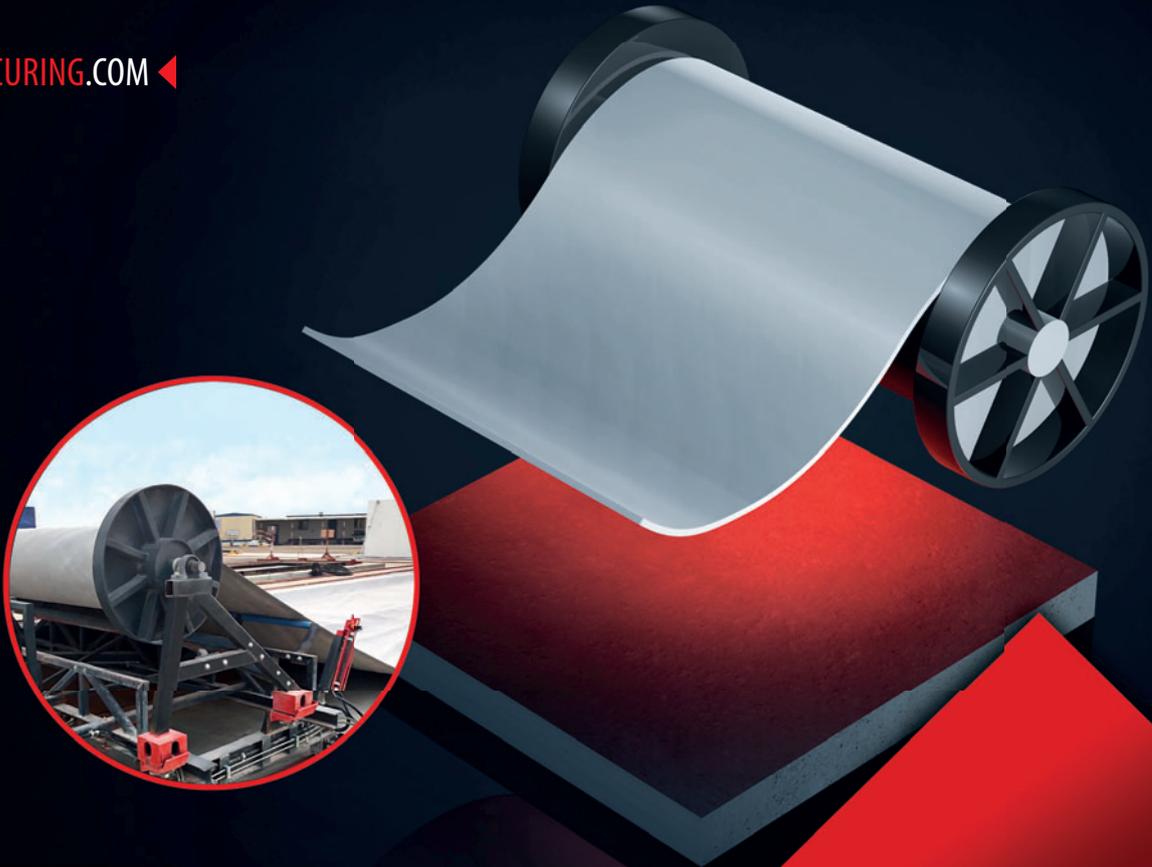
*An example of Hi-Tech's scope of precast concrete villa supply and an excellent example of the benefits of precast concrete's advantages in terms of speed of erection, quality, efficiency, versatility and durability.*

CONCRETE TARP ROLLER FROM KRAFT CURING SYSTEMS

# TARP ROLLER

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A total of 6 hot water supply lines supply 95°C hot water to a total of 6 casting beds. Each line includes an automatic valve with (orange) actuator. One main return line for all 6 casting beds returns water back to the water heater for reheating.



Containerized ThermalCure Accelerated Concrete Curing System pre-installed, pre-plumbed and pre-wired in an insulated, vented and lighted 20-ft. shipping container for immediate installation and quick commissioning.

The company produces hollow-core slabs, cladding and sandwich panels, precast columns, beams and foundations as well as custom precast components, blocks and block paving products. Current projects include 3,558 unit precast villas in Dubai and Abu Dhabi, the Maple townhouses, the AKOYA Oxygen luxury homes, the Nad Al Shaba villas, the Mudon townhouses, the Yas Island villas and the ADNOC Ruwais Housing Complex Expansion.

Hi-Tech Concrete Products is a member of ACI (American Concrete Institute), PCI (Precast/Prestressed Concrete Institute), GRCA (International Glassfibre Reinforced Concrete Association) and ISO 9001 certified. The company employs a multinational workforce and operates plant and equipment worth over AED 800 million (approximately € 200 million).



AutoCure Automatic Curing Control System provides for control of casting bed temperature for 6 beds, individually, using threaded temperature sensors, located at the casting beds. An economical and effective curing control system.



On-grade installation of the ThermalCure hot water supply and return lines and connection to the casting beds.

Hi-Tech specializes in the manufacture of hollow core slabs which are the most widely used precast flooring system due to their highly efficient design and broad range of load carrying capacity. With slab thicknesses from 150 to 500 mm and from 1.2 to 2.4 m widths, Hi-Tech offers a complete range of hollow-core slab components.

### 2017 - Continued Growth with a new Dubai production facility

With manufacturing facilities in Abu Dhabi and Al Ain, Hi-Tech's 3rd location - a new precast manufacturing plant in Dubai - is under construction and expected to be completed by the 4<sup>th</sup> quarter of 2017. The company specializes in mobile precast facilities in which the quality of precast concrete is combined with minimal transportation and logistics issues.

### United Arab Emirates - The growth of a modern Gulf Country

The development of the United Arab Emirates - a federation of 7 emirates, established in 1971, including the emirates of Abu Dhabi and Dubai - over the past 25 years is nothing short of phenomenal, not only encompassing two of the globe's most modern, safe, clean and innovative cities, but outclassing almost all other destinations with its efficient transportation network, excellent culinary outlets, high-class hotels, clean beaches - not to mention fantastic weather - and providing insight into a vibrant modern Gulf society.

One need only to look at the following facts to see how the need for efficient, effective, high-value and - most importantly - fast construction shows off the benefits of precast concrete products in the UAE.

- 1 out of 4 cranes on earth is located in Dubai (Source: Gulf News)
- Of the UAE's 9.2 million population, almost 8.0 million are foreign nationals (Source: BBC News, 2016-09-28)
- The UAE has the 7<sup>th</sup> largest reserves of oil and 17<sup>th</sup> largest reserves of natural gas in the world (cia.gov, 2012-10-04)
- The UAE will host EXPO 2020 - a first in the gulf region.
- Dubai is building a climate controlled city 2.25 times the size of Monaco (Source: Yahoo News)
- Masdar City, Abu Dhabi is the world's first zero carbon, zero-waste, car-free city.

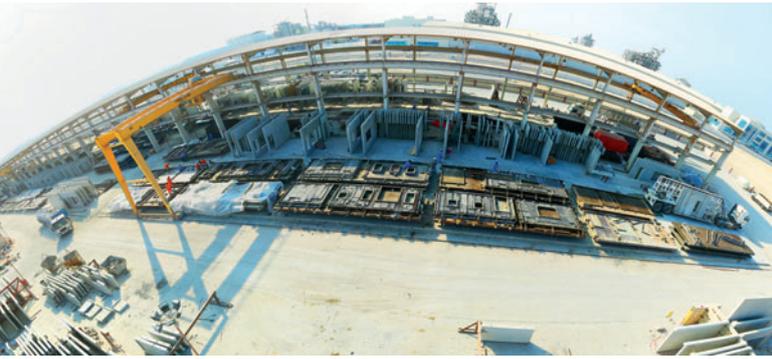
### 2014 - Increasing Capacity

In 2014, Hi-Tech's Abu Dhabi factory expanded its operations by installing a new hollow-core line in order to meet the severe demands on its production capacity. Today, Hi-Tech produces in 2 shifts between 700 and 950 cubic meters of precast and prestressed concrete elements utilizing five (5) each 180-meter-long hollow-core beds, and 120 tilting tables, employing over 1,400 production personnel.

### Double Casting - Accelerated Curing, Justifications and Choosing the Supplier

During the expansion of the plant, General Manager Engr. Samir Koblawi took the decision to design the hollow-core production lines so that he could double-shift the beds - allowing for close to double the production capacity of the 5 beds. His decision to implement an accelerated curing system by circulating 95°C hot water under the 5 beds allowed for de-tensioning of the concrete within 7 to 8 hours after production.

Hi-Tech Concrete Products considered many factors before moving forward with their plan of double-casting.



*Birds-eye view of a portion of the Hi-Tech tilting table production area and precast wall storage. Hollow-core production area is located under the roof section of the factory.*

First, in order to ensure that the heating of the concrete did not cause moisture loss from the surface of the concrete, they installed a tarpaulin covering system that allowed for quick and simple covering and uncovering of the hollow-core concrete. The cover not only eliminated moisture loss, but prevented dry-shrinkage cracks, brittle corners and edges and prevented heat loss which reduced operating costs.

Second, Hi-Tech Concrete Products required a location for the heating system that did not take much space, provided close access to the casting beds, protected the curing equipment from the elements and allowed for quick installation as well as simple maintenance. The solution for this was the design of the curing system within a 20-foot shipping container, which included all necessary operational components as well as the environmental protection he required.

Third, in order to justify the expense of the curing system, Hi-Tech Concrete Products compiled a list of the marketing ben-

efits such as elimination of cracks, harder corners and edges, reduced delivery times and the ability to utilize a minimum of 30% GGBFS (ground, granulated, blast furnace slag) – a requirement for any concrete construction in the Emirate of Dubai. In addition to the benefit of double casting the beds, he was also able to show significant cement cost savings due to the use of heat curing.

Finally, Engr. Koblawi had his plan for the accelerated curing system as well as the necessary justifications and investment approvals. Now, all that was required was to find a supplier that could meet his requirements.

Consulting with other precast producers and based on several other factors such as quality of the technical proposal and pre-sales technical support, Eng. Koblawi chose Kraft Curing Systems’ ThermalCure Accelerated Concrete Curing System. “Obviously, the price of the system was important as I have a responsibility to the owners of the company to get the best deal possible. However, the 6-year heating unit warranty indicated to me that Kraft Curing is using high quality materials. No one else offers a 6-year warranty. In addition, I have a great amount of respect for Kraft’s local sales and service agent, Mr. Kishore Gogia of Webau Middle East. The relationship I have with Kishore gives me the peace of mind that if I do have a break-down, he will take care of things.”

**Curing System Design and Implementation**

Kraft Curing Systems designs ThermalCure concrete curing and heating systems in skid-mounted and containerized models. In this case, due to the placement of the equipment - near the production area, the climate - very hot during the day and cold at nights and the space restrictions - small narrow outside space, Kraft designed a containerized curing system using a well ventilated and insulated 20-foot shipping con-



*Hi-Tech produces a wide variety of hollow-core sections including various widths for greater installation efficiency and thicknesses for longer spans in order to best meet their clients’ requirements.*



*One example of Hi-Techs precast concrete panels installed in a system for the efficient and quick erection of residential villas, commercial units and mid-rise structures.*

tainer for the protection of the 94% efficient water heater, water filtering, water circulation pump, the five (5) hollow-core heating loops and the control system.

The five (5) each 180-meter-long and 1.2-meter-wide production beds were capable of producing hollow-core components up to 500 mm high. With a curing temperature requirement of 60°C and an average outside temperature equal to the mid 30s Celsius during the day, it would be simple to say, not much heat is required. However, the nighttime temperatures dipping to the lower teens and the possibility of a sixth bed, the design includes a 450 kW per hour water heater capable of delivering 95°C water to the casting beds.

All the curing system components were pre-assembled, pre-wired and connected inside the insulated shipping container. The container includes, cross ventilation, lighting, frost protection, cooling of control panels, fire protection as well as surge protection and electrical outlets for later additional equipment.

Once the equipment arrives on-site and is securely located, all connections (diesel fuel, electricity, water supply as well as hot water supply and return) are made through the container walls and roof (exhaust flue). Connections are supplied with the container for ease and quickness of installation.

In addition to the heating system and since a heating system is only as good as its control, Kraft Curing supply an automated curing control system known as AutoCure®. In the Hi-Tech project, the controls are very simple yet effective and efficient two-point thermostat controllers using Kraft Curing's unique temperature measurement sensors. Threaded into the underside of the hollow-core form and measuring the concrete temperature exactly at the surface of the casting bed, these threaded surface reading sensors, are an incredibly effective, simple and inexpensive solution for measuring concrete temperature for all concrete products cast on steel tables, beds or in steel forms.

Within a matter of 24 hours after delivery, the containerized ThermalCure accelerated concrete curing system may be up and operational.

### Challenges of a Concrete Producer

One of the biggest challenges of any precast manufacturer, according to Engr. Koblawi, is the timing of supply and demand - with the jobsite's demands dictating the supply of the precast. If the jobsite is slow, then the precast inventory builds-up, filling all possible areas of storage. If the jobsite is ahead of schedule or needs precast products quickly with short lead times, Hi-Tech is now able to meet the site's needs. With the accelerated curing system, delivery delays due to concrete hardening are a thing of the past.

### 2 Years' Experience

Hi-Tech Precast Concrete sums up the benefits of the ThermalCure system as the ability to double cast on a daily basis

thereby increasing output without adding additional production capacity and space, to use 30% GGBFS in the mix design, to reduce OPC content and to deliver a higher quality product free of shrinkage cracks and with harder corners and edges in a shorter time.

When sales demand doesn't dictate high production rates and double casting is not required, the curing system may be shut-down - ambient temperatures permitting. When production rates are high, the curing system eliminates the need for additional production beds that would reduce the amount of valuable storage space.

### 2017 and the new Dubai Production Plant

"We are pleased with the curing system's benefits and minimal maintenance requirements," explains Eng. Koblawi. "In fact, we are so pleased that we are working with Kraft Curing on the design and supply of a second ThermalCure system for our new Dubai production facility. The new facility brings us closer to the dynamic Dubai market where our clients place a premium on quality, the 30% GGBFS requirement and where the lack of space requires us to produce and deliver very efficiently. Based on our experience with Kraft Curing, we are comfortable that they will help us in meeting these criteria." ■

### FURTHER INFORMATION



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