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Above and below: Port Marina readies for the start of its first season. Virtually all racks are sold, either to owners of the associated condominiums or members of the public.

Scaling the heights

The Port Marina on 17th Street in Ft Lauderdale, Florida features 89ft high stacks accommodating vessels up to 52ft long weighing up to 35,000lbs. Fully automated with laser-guided precision lifting for boats of any size to any level, it could be the start of a new concept in skyscraper drystacks.

The Port Condos and Marina is the world's first bridge crane boat storage rackominium – a drystack with an associated residential condominium tower – and the prototype showpiece for US company Vertical Yacht Storage Systems (VYSS). It is based on technology developed by Bill Maffett and his team at Maff-Stack that caught the attention of property developer Chris Rosenberg back in 2001.

Rosenberg had recently purchased Everglades Marina, a rundown drystack in Florida in need of redevelopment. "I was concerned about the damage I saw being done to boats by forklifts and considered traditional drystack to be a risk," he told *Marina World*. "When I came across Bill Maffett and his Maff-Stack system I saw potential and was very taken with the idea. At this stage it hadn't gone further than the drawing board so I made a deal with Bill to help him put the technology into practice in exchange for a share of the company."

Rosenberg and other directors, including Bill Maffett, subsequently formed two companies - Maff-Stack, the technologies company directed by Bill and his son Brian along with structural engineer Mark Williams and Chris Rosenberg (the technical entity and patent owner) and Vertical Yacht Storage Systems (the marketing and licensing arm).

The technology

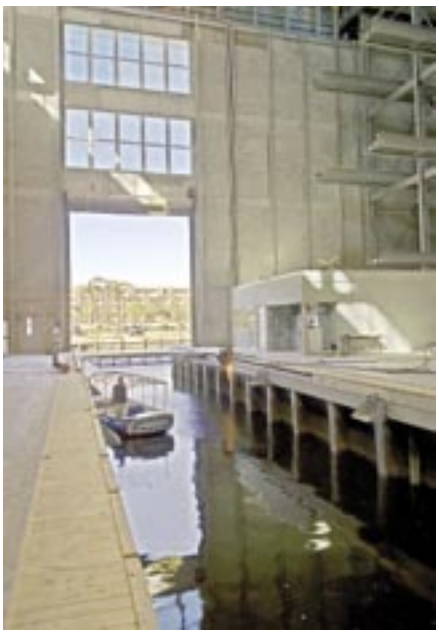
The Maff-Stack system was first described in *Marina World* back in July 2002. It has five main components:

1. The standard dual-girder overhead bridge crane, which runs the length of the facility. This can be extended out past the shoreline to deep water if necessary.
2. A specialised rotating four-point lift trolley, supported from the bridge with the ability to travel the width of the facility. The four cables, which extend down from the trolley and hold the cradle, are connected to a common cable hoist on the trolley and are long enough to reach the water.
3. The boat transport cradle, supported overhead by the trolley. While in transit, the boat rides within the cradle on two longitudinal rail supports. The boat is positioned within the cradle so that its centre of gravity falls within the footprint of the four cables and no moment forces are applied to the bridge. The cradle is a 'one size fits all' apparatus designed for the range of boats being served at each individual facility. Support air bags are incorporated in the cradle assembly to protect the boats by eliminating any point loads.
4. A specialised rack/building system that supports the bridge crane as well as the boat storage locations. Boat berths are positioned perpendicular to the travel of the bridge crane and parallel to the travel of the trolley/cradle. Berths are located opposite one another on both sides of the centre aisle of the facility in a similar fashion to a traditional forklift operation. Each boat berth comprises two support steel beams with padded rails, which cantilever out from the building's sidewall structure. The boat rests on these two padded rails while in storage. The centre-to-centre positioning of the rails is a fixed dimension, set so as to clear the two cradle support rails during placement or retrieval of the boat. Multiple sets of the cantilevered support rails are centred one above the other in stacks. Each pair of rails consists of one berth. Clearance is maintained between separate stacks so as to allow for the trolley/cradle cables. The vertical spacing between berths is adjustable for various boat heights by vertically repositioning the cantilevered support rails via bolted connections. The rack system contains no moving parts or secondary cradles left attached to an individual boat.
5. A traditional computerised 'lights out' warehousing automation system. This controls all activity, thereby effectively moving the human role from active participation to overseer. All motors are electrically driven with variable speed drives for precise positioning. Photo eyes, lasers and proximity switches provide input to the system for location and movement of the bridge, trolley and cradle.

The advantages

While offering the same advantages to boat owners as a traditional drystack arrangement (e.g. lower maintenance costs, lower boat depreciation, reduced insurance premiums), the Vertical Yachts' system gives marina operators the option to stack long, heavy boats on high racks. As Bill Maffett succinctly told *Marina World* in 2002 'we've added the vertical dimension'.

Fork lift technology has advanced considerably in recent years and R&D



continues. Even leading manufacturers might baulk, however, at designing a fork lift to manoeuvre vessels up to 80ft long for a 250-300ft high ten-storey drystack! VYSS is currently working on just such a project for a client in the north east USA. "The engineering is largely complete – the challenge lies in designing a winch spool to cope with the height," Rosenberg confirmed. And, yes, if the project proceeds it will be a skyscraper drystack, featuring spandrel glass to resemble an office block. Around 10-15 boats will be stored on each level and heavy boats will make it just as easily to the top floor as to the basement.

Having been through the development and planning processes first hand, Rosenberg partnered with Andrew Sturner of Aqua Marine Partners, a US based marina investment and management firm, and has formed Vertical Yacht Club Development LLC (VYCD), an affiliate dedicated to developing projects on a turn-key basis from the ground up, and offering advice and assistance for large-scale marina and condominium projects.

The company can undertake the processes for all land-use, zoning and government approvals, coordinate with VYSS Technologies to prepare all site plans and work required to obtain permits; prepare all market studies; arrange construction financing; and undertake all pre-sales marketing. VYCD will break ground later this year on two projects: the first in Aventura, Florida, which will house 240 boats up to 45ft and weighing 45,000lbs; and the second in Ft Lauderdale, which will house up to 200 yachts of up to 72ft/100,000lbs.

The key for any VYSS project is planning, the major hurdle, after all, for most developments. The good news, however, is that height and size make a very big difference to the economics, as Rosenberg revealed. "Cost is a big issue and we've worked very hard to get this right. At 28-36ft, our facilities are competitively priced when compared to conventional dry storage facilities but 15% cheaper in operating costs. The taller and bigger the facility, the more profitable it is. It can be twice as profitable as a traditional drystack."

Gantry-based drystack systems undoubtedly save on aisle space. VYSS claims a space saving of 20-50% in this area, which equates to around 20% more cubic space for revenue-generating storage. Large yachts can be stored on every rack as opposed to the bottom rungs as the overhead crane system has no height limit and typical forklifts are height limited to around 50 feet. The VYSS option can be practically and economically constructed up to 200 feet (and probably beyond) meaning that a smaller footprint of costly waterfront land is required for a profitable drystack operation.

Build cost savings can also be made as the structure does not require a heavy-duty 18 inch poured concrete floor slab.

In fact, the system can be operated without a floor in some challenging environments. Excavation, levelling and site preparation are also less than that required for conventional floor-based structures and greater opportunities exist to develop 'awkward' sites for drystack use thus maximising boat storage opportunities at any waterfront site. For example, the VYSS team is currently designing a system for the Lake of Ozarks in Missouri, USA, that backs into the hillside starting out as a one-storey system and progressing outwards to five storeys.

An option also exists to incorporate a set of angled tracks and a counterweighted track car, which can push the boat cradle out and away from the storage facility towards deep water. This arrangement makes sites that have steep slopes above the shoreline, excessively high water fluctuation (20+ feet) or extremely shallow shoreline water viable for development.

Reliability and operating costs

The automated and electric lifting and moving system is very reliable with no messy or high maintenance hydraulics. It is also safe from harsh operator use. The laser guided computer controlled system eliminates the need for tandem lift operation (e.g. use of both a spotter and an operator sometimes adopted in traditional operations) as it lifts and spots the boat while moving 360 degrees around the vessel to ensure proper placement. The system can lift and launch a large boat in just 6-7 minutes.

The long life electrical motors and automated controls are very low in maintenance and energy costs when compared to fossil fuel driven forklifts. Regular maintenance costs of the industrial rated bridge crane are significantly lower than that of a forklift as none of the mechanical components ever come in contact with salt water and no hydraulics are used.

VYSS utilises industrial bridge cranes as used in all-year-round manufacturing environments e.g. steel mills and automotive plants. The crane is used at around one third of its industrial duty cycle and is thus estimated, when properly maintained, to have an effective life of 100 years.

Port Condos and more

The high-rise condominium market, especially in Florida, continues to absorb waterfront and marine facilities for residential use posing an increasing threat to boating. Port Condos, which opened in January this year, by incorporating a 'vertical' drystack building is an ideal compromise arrangement for maximising returns on property development without robbing the area of its much needed boat storage.

Developers set up a residential condominium association, which sold the first 80 (of a total of 129) condos with drystack slots. The association then opened the sale to buyers seeking just a condominium and has finally made remaining drystack slots available for the general public. As *Marina World* went to press, just 18 of the 125 drystack slots remained unsold and the building was starting to fill as the vacation season got under way.

VYSS is currently in the process of establishing a network of regional distributorships around the world and Rosenberg reported a strong level of interest from Europe, Central America, the USA including Hawaii, Australia, New Zealand and Dubai.

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