

# INNOVATION IS THE KEY TO OUR COMPETITIVENESS



Innovation has been a critical success factor accelerating the Group's growth momentum. Through sustained investments in research, innovation and technology, the Group continued to strengthen its technological and competitive capabilities to meet the immediate and long-term needs of its customers and stakeholders.

## New R&D Subsidiary

The constant harnessing of innovation to increase its portfolio of strategic intellectual assets has enabled the Group to forge up the value chain and secure its lead in the industry. Signaling its intention to intensify its innovation efforts, the Group established a subsidiary dedicated to research and development during the year.

In mid 2007, Sembcorp Marine Technology was set up to spearhead new product development and process innovation to further strengthen the Group's core competencies in ship repair, shipbuilding, ship conversion, rig building and offshore engineering & construction. The new subsidiary would expand on different technologies and niche products for greater market differentiation and competitiveness. These efforts would, in turn, allow the Group to build closer customer relationships, enhance operational performance and discover new opportunities for growth.

## Innovation Excellence Award

During the year, Jurong Shipyard became a proud recipient of the Singapore Innovation Excellence Award conferred by the Singapore Quality Awards Governing Council and administered by SPRING Singapore.

The Innovation Excellence Award was an affirmation of the yard's continuous commitment to leverage innovation for business excellence. It also recognised the yard's sustainable organisation-wide innovation systems, which provided a pipeline of breakthrough and incremental innovations for business growth and performance improvement.

The yard's strong innovation culture is manifested in all aspects of its operations – from its leadership, people and processes to its planning, information systems and performance. Further testament of Jurong Shipyard's innovation capabilities is reflected in its Singapore Innovation Class certification in 2005 and the Singapore Innovation of the Year Award accolade in 2003 for its proprietary "Load-out and Mating-in-Dock" method of fast-track semi-submersible rig construction.

## DESIGN & ENGINEERING INNOVATIONS

### Proprietary Design Enhancements

Research continued in the area of refining the Group's proprietary designs in high-performance rig and vessels. These efforts were focused on developing critical components to enhance the performance of rigs and ships to meet future challenges, especially in deepwater exploration and drilling. The Group's proprietary assets currently include the popular Baker Marine Pacific Class 375 jack-up and the Jubilee Class 2,500 to 2,600 TEU containership designs.

### Transverse Skidding and Load-out & Mating-in-Dock

For the first time, Jurong Shipyard applied its newly developed "Transverse Skidding" technique together with its breakthrough "Load-out & Mating-in-Dock" process for the fast-track construction of two sixth-generation semi-submersible rigs, West Sirius and West Taurus, for Norway's Seadrill.

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The first rig unit, West Sirius, was successfully assembled in the second quarter of 2007 using the “Load-out & Mating-in-Dock” technique. Here, the rig’s upper hull was built on a skid truss on reinforced land and skidded over and mated with its lower hull in the drydock. The “Transverse Skidding” technique was then used to transfer the upper hull of the second semi-submersible rig, West Taurus, onto the withdrawn skid truss via a side-skidding process in preparation for its load-out and mating operation.



The combination of these two processes enabled multiple rigs to be constructed simultaneously and assembled sequentially in a safe and secure manner at relatively lower cost. The “Transverse Skidding” process further improved on the original “Load-out & Mating-in-Dock” technique which allowed only one semi-submersible to be built at a time.

### National Day Parade Floating Platform

Sembcorp Marine demonstrated its innovative design and engineering capabilities to the nation by constructing the world’s largest floating platform for the National Day Parade 2007. The project was commissioned by the Defence Science and Technology Agency.

The floating platform, which measured 120 metres x 83 metres x 1.2 metres, was larger than the National Stadium field. The Group’s engineering



1. Designing the floating platform.



2. Precision cutting of steel plates and components for pontoon fabrication.



3. Pontoon fabrication in progress.



4. Stringent dimensional and quality control checks to ensure pin-point accuracy during production and fabrication.



Ready for NDP action – The world’s largest floating platform built by Sembcorp Marine.



5. Completed pontoons being launched on water.



6. Mindef personnel testing the pontoons.



7. Towing the pontoons to Marina Bay.



11. Floating platform opened to public during Singapore Combat Engineers 40th anniversary in April 2007.



10. Linkways installation.



9. Assembling the floating platform at the Marina Bay.



8. Installation of connector pins to join the pontoons.

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team lent its expertise to develop a design comprising 15 reconfigurable pontoons of 40 metres x 16.6 metres x 1.2 metres to allow for quicker assembly while afloat. This was made possible via a unique system that utilised 80 side connectors and 20 diamond-shaped corner connectors, which were light-weight enough for installation afloat but robust enough to take a heavy weight of 1,070 tonnes. At the celebrations, the platform had to accommodate about 9,000 people, 200 tonnes of stage props and three 30-tonne vehicles. The connectors also provided the required stability and flexibility for the platform to be disassembled and reconfigured into different formations as required.

To ensure high standards of precision, a “Central Kitchen” concept was adopted under the Group’s Total Quality Management strategy. This meant that steel plates and components were prepared with precision at a workshop in Jurong Shipyard before being transported in kits to different locations for construction.

Through innovative and strategic engineering, the floating platform was successfully delivered on schedule and in time for the Singapore Combat Engineers’ 40th anniversary celebrations in April.

## INNOVATION NETWORKS

### R&D Collaborations

In addition to developing in-house capabilities, the Group also collaborated with tertiary and research institutions to bolster marine and offshore research and development on an industry level.

During the year, Sembcorp Marine signed a memorandum of understanding with the National University of Singapore’s Centre of Offshore Research and Engineering in support of its Offshore Technology Research Programme. Jurong Shipyard and Sembawang Shipyard also pledged their support to work with Ngee Ann Polytechnic’s Centre of Innovation together with their contractor partners on various innovation projects.

These moves followed an earlier collaboration between PPL Shipyard and A\*STAR under the “Lab-in-R1” programme to develop and enhance proprietary rig designs and critical components for enhanced performance.

### Industry Exchange

Knowledge transfer networks beyond the Group constantly promoted the sharing of new ideas and insights within the industry. In this area, Jurong

Shipyard shared its innovation journey and strategies during SPRING Singapore’s “Business Excellence Best Practice Series” forum in March 2007. The yard’s Managing Director Mr Wong Weng Sun spoke on the topic “Leadership in Cultivating Innovation” and provided an overview of the yard’s innovation excellence framework and integrated management systems and processes.

## INNOVATION CULTURE

To nurture an innovative and thinking workforce, a series of programmes were held to encourage employees to seek novel solutions for improving work processes and operational effectiveness.

### Innovation Carnivals

Sembcorp Marine’s “Having Fun with Innovation” campaign launched at the end of the year saw employees from the Group’s subsidiary yards coming together to share ideas and showcase their creative inventions. As part of this drive, innovation carnivals were held in both Jurong Shipyard and Sembawang Shipyard.

The carnivals sought to promote a creative thinking culture and the proactive contribution of innovative solutions for quality, productivity and safety improvements.

Employees were encouraged to think of themselves as Change Innovation Agents who would translate innovative ideas into practical projects to improve current work processes and maximise operational effectiveness.

### Safety Innovation Teams

Employees teamed up once again to apply their ingenuity in Safety Innovation Teams Conventions held annually by the Group’s yards. These competitions, which attracted employees from different sections, aimed to foster a culture of safety, innovation and continuous improvement among staff. Winning teams from the various yards went on to compete at the industry and national levels.

### Creative Thinking Workshops

To stimulate creative thinking among employees, the Group continued to hold interesting and interactive workshops and courses. During such sessions, participants were inspired to look at situations and explore solutions from fresh angles in both their work operations and personal lives.

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### EMPLOYEE INNOVATIONS AT WORK

Sembcorp Marine's strong innovation culture has resulted in many brilliant and creative inventions conceived by employees across the Group. Some significant innovations have reaped cost savings and improvements in productivity, quality and safety.

#### Electro-Hydraulic Cylinder Nut Extractor

The award-winning Electro-Hydraulic Cylinder Nut Extractor is an innovative device developed by the LIFE Team in Jurong Shipyard for the efficient and safe extraction of cylinder nuts during hydraulic cylinder overhaul. It replaces the traditional method, which was not only time-consuming and laborious but also put employees at high risk of injuries or near-miss incidences. The new invention introduces a hydraulic jacking component to quickly, safely and effectively remove the cylinder nuts. This has led to cost and time savings of about 75%, reducing incidences and enhancing employee morale and productivity.



#### T-Girder Fabricator and Safe 'T' Holder

Created by Sembawang Shipyard, the award-winning T-Girder Fabricator and Safe 'T' Holder provides a means of preventing steel-plate girders from toppling over during the steel fabrication process. This specialised equipment greatly reduces the risk of hand and finger injuries and eliminates redundant work steps during the fabrication of the 'T' girders, resulting in improved safety and productivity.



#### Pipe Copier Kit

The Pipe Copier Kit replaces the conventional moulding method of pipe fabrication, which required welding an old pipe sample to a platform and using angle bars and flanges to create a mould to fabricate the new pipe. The innovation now enables the moulding of pipes of different dimensions and eliminates the need to cut and remove the sample pipe. Besides minimising hazardous work, this device proved it could shorten the pipe fabrication process significantly by 50 per cent, leading to improved quality and cost-savings of more than \$144,000 per year. The Jurong Shipyard innovation was awarded the Merit Award at Sembcorp Industries' IDEA award.



#### Pipe Spools Barcoding System

Sembawang Shipyard is the first shipyard in the world to track the pipe-fabrication process with a Pipe Spools Barcoding System. This innovation provides a long-term solution for spools tracking and

monitoring during fabrication, increasing management efficiency. As an efficient and effective monitoring tool, it enables faster turn-around time for pipe repair and fabrication. The implementation of this innovative system is estimated to generate manpower, material and time savings of \$684,500.

#### Ext-Box

The Fire Extinguisher Box, or Ext-Box, is designed with a built-in indicator function to alert workers if the fire extinguisher in the box was removed or if the fire-fighting agent inside was below the minimum level. It ensures that a fully-functional extinguisher is always on standby in the event of a fire, thus increasing workers' morale and safety. This innovation, developed by Team PPL from PPL Shipyard, clinched the Bronze medal at the ASMI Workplace Safety and Health Award.

#### Pipe & Tube Beveling Device

Jurong Shipyard worked with DME Contractor and Kok & Chan Marine Services to develop the Pipe and Tube Beveling Device. This portable and high-speed pneumatic-powered device accelerates the process of pipe grinding to remove oxide contaminants in preparation for welding. It shortens the grinding process, which was traditionally time-consuming and labour-intensive, enabling greater efficiency in the edge preparation of pipe joints.

#### SAMWELDAR

Sembawang Shipyard collaborated with its contractor partners on the Semi-Automated Multiple-Nozzle Welding with Electronic Logic Device & Auto-Pipe Rollers (SAMWELDAR). This innovation reduces the need for coded welders to be physically present to monitor and control the welding process. The SAMWELDAR uses an electronic controller and a laser alignment jig to operate and control the pipe roller and machines for precision welding. It includes a closed-circuit television for the remote monitoring of the welding process. With the invention of this automated device, the yard expects weld quality and efficiency to increase significantly.