Joint Message from Chairman and CEO

FY2016 Highlights

Board Members

Senior Management

Creating Land and Space to Support the Growth of Industries

Developing Next-Generation Estates

Supporting the Public Service’s Infrastructure Needs

Driving Innovation, Productivity and Sustainability

Financial Highlights and Review

INSERT

Review of Subsidiary: Jurong Port
MISSION
To develop industrial infrastructure to catalyse the growth of new industries and transform existing enterprises
In FY2016, we continued to develop next-generation industrial solutions to support industries. We broke ground and commenced construction of JTC Logistics Hub @ Gul and also completed a number of developments, including JTC Aviation Two @ Seletar Aerospace Park, JTC Chemicals Hub @ Tuas South, JTC nanoSpace @ Tampines, JTC Space @ Tampines North, JTC Space @ Gul, and three new blocks in JTC LaunchPad @ one-north.

We also remained committed to driving innovation, productivity and sustainability across our developments and estates. Through our second open innovation call, we are supporting 10 enterprises to jointly develop innovative solutions for efficient management of industrial buildings and developments. These innovations are being test-bedded in our buildings and estates, which continue to serve as living labs to support the development and trials of new solutions.

At CleanTech Park, JTC, NTU and the Land Transport Authority have launched a research and testing centre as well as a test circuit for autonomous vehicle technologies. Meanwhile at one-north, we are hosting Singapore’s first public road trials of driverless vehicles and the world’s first trials of self-driving taxis. These initiatives will not only help improve connectivity within our industrial and business parks but also enable Singapore to move closer to the widespread deployment of autonomous vehicles.

With JTC’s expertise spanning a development’s life cycle, we have been appointed as the Centre of Excellence (CentEx) for Building & Infrastructure projects, underground caverns and facilities management. In our role as CentEx, we have begun supporting public sector agencies’ projects, such as the building of the upcoming State Court Complex and Stamford Arts Centre. We look forward to expanding and deepening our innovation and R&D efforts to create greater value for public sector projects.

For Singapore’s future economy to remain competitive and relevant in the face of unprecedented global challenges, we need to develop a vibrant and connected city of opportunity, transform and strengthen our industries, and build partnerships to enable innovation and growth. In FY2017, we will continue our work in supporting the future economy with these strategies in mind. Our next-generation developments and estates will facilitate partnerships among our customers, support industry transformation, and help enterprises to scale up through clustering and access to shared services. These include JTC nanoSpace @ Tampines and JTC Chemicals Hub @ Tuas South, both of which will be completed in 2017, as well as the new Jurong Innovation District and Punggol Digital District, which we are masterplanning and developing. We will continue to work closely with Trade Associations and Chambers (TACs), which will play a larger role in leading industry transformation. The Trade Association Hub at the Jurong Town Hall building will open towards the end of 2017, bringing together TACs, strengthening their capabilities and facilitating cross-industry collaboration.

Come 1Q 2018, some 10,700 industrial units and 520 industrial land leases currently under HDB will be transferred to JTC. The consolidation of all public sector industrial land and properties under a single government agency will enable us to better support industrialists in their business growth.

Finally, we would like to express our appreciation to the JTC Board for their guidance and support of our work. We would like to thank the board members who have stepped down in March 2017, including Mr Danny Teoh, Mr Tan Chee Meng and Mr Augustin Lee, for their valued counsel and direction. We would also like to thank our customers, business associates, partners and all JTC colleagues for their support and dedication. Together, we will continue to push boundaries and create tomorrow’s industry spaces for a thriving, future economy.

Dr Loo Choon Yong Chairman JTC Corporation

Mr Png Cheong Boon Chief Executive Officer JTC Corporation
FY2016 HIGHLIGHTS

Allocated 106.5 hectares of industrial land to 108 companies comprising:

- 31% Chemicals
- 23% Transportation & Storage
- 11% Construction
- 5% Precision & Transport Engineering
- 5% General Manufacturing
- 25% Other Industries
Allocated 84,300 SQM of industrial space to 168 companies comprising:

- 29% Professional, Scientific & Technical Activities
- 13% Precision Engineering
- 12% Information & Communication
- 7% Transport Engineering
- 7% Chemicals
- 32% Other Industries
CHAIRMAN

DR LOO CHOON YONG
Chairman
JTC
Chairman
Raffles Medical Group

MEMBERS

MR GUY HARVEY-SAMUEL
Chief Executive Officer
HSBC Singapore

MR AUGUSTIN LEE
Deputy Secretary
Ministry of Manpower

MR NGIAM SHIH CHUN
Deputy Secretary (Industry)
Ministry of Trade & Industry

MR LEE CHONG KWEE
Chairman
Jurong Port Pte Ltd
(Till 30 Sep 2016)

MR OLIVIER LIM
Chairman
Certis CISCO Security Pte Ltd

MR TAN CHEE MENG
Deputy Managing Partner
WongPartnership LLP

MR DANNY TEOH
Former Managing Partner
KPMG LLP

MS JESSIE YEO
Executive Secretary
Metal Industries Workers’ Union
Director
Industrial Relations Mentoring

MR NG LANG
Chief Executive Officer
Urban Redevelopment Authority

MR YEOH OON JIN
Executive Chairman
PricewaterhouseCoopers LLP

MR PNG CHEONG BOON
Chief Executive Officer
JTC
SENIOR MANAGEMENT
As of 31 Mar 2017

MR PNG CHEONG BOON
Chief Executive Officer
JTC

MR HEAH SOON POH
Assistant Chief Executive Officer
Engineering & Operations Group

MR TERENCE SEOW
Assistant Chief Executive Officer
Corporate, Policy & Planning Group
Vice-Dean
JTC Academy

MR ALVIN TAN
Assistant Chief Executive Officer
Cluster Group

MR DAVID TAN
Assistant Chief Executive Officer
Development Group

MR GOH THONG
Director
Audit & Advisory

MS SUSAN GOH
Director
Logistics & Land Transport

MS KHOO WEE LIN
Director
Infocomm Media & Startup

MS CINDY KOH
Director
Energy & Chemicals

MR LEONG HONG YEW
Director
Food & Lifestyle

MR HAROLD SOONG
Director
Emerging Clusters

MS GLORY WEE
Director
Aerospace, Marine & Urban Solutions

DEVELOPMENT

MS JOSEPHINE LOKE
Group Director
Land Planning & Redevelopment

MR ANIL DAS
Director
Innovation Programme Office

MS VIVIEN TAN
Director
Land Redevelopment

MS TANG HSIAO LING
Director
Land Planning

CLUSTER

MR LEOW THIAM SENG
Group Director
Cluster Group

MS MA PING NEE
Group Director
Cluster Group
Director
Products

MS JOANNE TAN
Group Director
Cluster Group
Director
Biomedical & Electronics

MR CHEANG TICK KEI
Director
Precision Engineering & Construction
**SENIOR MANAGEMENT**

**MR AARON THAM**  
Director  
New Estates 2

**MS FINN TAY**  
Director  
New Estates 1

**MR TAY TER LONG**  
Director  
Contracts & Procurement

**ENGINEERING AND OPERATIONS**

**MR PNG GIOK HUA**  
Group Director  
Infrastructure Development  
Director  
Innovative Space  
Vice-Dean  
JTC Academy

**MR CALVIN CHUNG**  
Director  
Reclamation & Infrastructure

**MR KOH CHWEE**  
Director  
Technical Services

**MR MARK KOH**  
Director  
Facilities & Estate Management

**MR ONG CHIA CHOONG**  
Director  
Security

**MR TEO TIONG YONG**  
Director  
Public Projects

**CORPORATE, POLICY AND PLANNING**

**MR HO TUCK CHUEN**  
Group Chief Financial Officer

**MR SEAH KEE POK**  
Dean & Advisor  
JTC Academy

**MS SIEW YIM CHENG**  
Chief Information Officer

**MR ANIL DAS**  
Director  
Corporate Planning

**MS CHEE WAN CHIN**  
Deputy Group  
Chief Financial Officer  
Director  
Finance Operations

**MS LEE CHUAY NOI**  
Director  
Human Resources

**MR WILLIAM LIM**  
Advisor

**MS YVONNE LIM**  
Director  
Policy & Research

**MR MOHD HAFIZ BIN SAYUTI**  
General Counsel  
Legal Services

**MR HAROLD SOONG**  
Director  
Corporate Finance

**MS VIVIEN TAN**  
Director  
Organisational Excellence

**MS CHRISTINE WONG**  
Director  
Communications
CREATING LAND AND SPACE TO SUPPORT THE GROWTH OF INDUSTRIES
Gross Allocation and Returns for JTC Prepared Industrial Land,* FY2012 to FY2016

Hectares

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*Gross Allocation for Prepared Industrial Land data excludes IGLS allocations

Gross Allocation, Returns and Occupancy Rate for JTC Ready-Built Facilities, FY2012 to FY2016

Occupancy Rate

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<tr>
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SELETAR AEROSPACE PARK
A WORLD CLASS AEROSPACE HUB

Who’s There?

More than 60 global and local aerospace companies

What’s New?

Completed Phase 1
The Oval @ Seletar Aerospace Park
A lush F&B and lifestyle destination for the growing community featuring refurbished black-and-white colonial bungalows

Completed
JTC Aviation Two
Additional 13,000 sqm of ready-built space provided for aerospace companies

1 JEP Precision Engineering
2 Airbus Asia Training Centre
3 Safran Helicopter
4 Satair
5 Standard Aero
6 CAE
7 RLC
8 Matcor Technology
9 Meggitt
10 Dedienne Aerospace
11 Sabena technics
12 Rolls-Royce
13 Bombardier
14 Wah Son Engineering
15 Bell Helicopter
16 ST Aerospace
17 JTC Aviation Two
18 JTC Aviation One
19 Jet Aviation
20 Hawker Pacific
21 Fokker Services Asia
22 Airbus Helicopters
23 MAJ Aviation
24 Wings Over Asia
25 Air Transport Training College
26 Vector Aerospace
27 Pratt & Whitney
28 Excel Aerospace
29 The Oval @ Seletar Aerospace Park
TAKING OFF TO NEW HEIGHTS AT
JTC AVIATION TWO

It’s all systems go, as Coway Engineering & Marketing gets set for its aerospace lift-off at Seletar Aerospace Park (SAP).

In July 2016, it shifted from Ang Mo Kio into JTC Aviation Two, a spanking new 11-storey high-rise facility for quick startups at SAP. “This gives our customers the assurance that we are a genuine aerospace player,” says Coway’s Managing Director Lien Whai Cheng. “We were, for instance, carrying out component repairs for the Boeing-777’s heat exchanger and it didn’t seem quite right doing this from a REIT building.”

“SAP provides a more stable operating base where we are more ready to invest in infrastructure,” he adds, citing for instance the long lead times needed for any new equipment to get certified.

“Being here also means we are closer to our existing customers like ST Engineering Group, Airbus’ helicopter arm and Rolls-Royce. It also gives us more business opportunities, as other companies which we’d earlier met now realise we are here, and this makes it more convenient for them to engage our services.”
This on-site stability has encouraged Coway to move up the technology ladder by, for example, investing in equipment for non-destructive testing of aerospace components “which we expect to start in a couple of months’ time,” Mr Lien says. The precision engineering company’s big push into the higher value-add aerospace business is vital as, like other SMEs here, it gets squeezed by rising costs and skilled manpower shortages.

Operating initially from home, Coway, set up by local entrepreneurs in 1996, has steadily built up its precision machining and engineering expertise to service the oil and gas, defence and aerospace industries. Now Coway is set to take off on its aerospace ambitions at Aviation Two, where higher ceilings have also helped shave down its space requirements.

While precision engineering was its mainstay at AMK, Coway is now gearing up to handle more aerospace component MRO (maintenance, repair and overhaul) activities, including MRO for bushings in landing gear. These are not core activities of OEMs (original equipment manufacturers) and it is where the Singapore SME spots opportunities. “The value-add for us from such aerospace repairs is double what we get from precision engineering,” says Mr Lien, “but of course our costs also increase.”

Beyond servicing aerospace companies in Singapore and Malaysia (accounting for 90 per cent of its current business), Coway is setting its sights on aerospace MRO customers in the Asia Pacific. It started working with consultants on this strategy back in May, Mr Lien discloses, adding they’ve “had good feedback from potential customers.” In a couple of years’ time, Coway hopes that the Asia Pacific will account for 10 to 20 per cent of its business.

Methodical in its expansion plans, Mr Lien also lets on that Coway has been “talking to potential SME partners here,” which offer other specialities like surface or heat treatment, and partnering up with them, so as to better compete with others in the region. This will allow Singapore to quote better prices and deliver shorter lead times.
JURONG ISLAND
SINGAPORE’S ENERGY AND CHEMICALS HUB

Who’s There?

More than

100 global companies
18,600 company employees
55,000 entrants daily for operations

What’s Up?

$742 million in new plant and machinery investments in FY2016

3 NEW PLANTS OPENED by Afton Chemical Asia, Celanese Singapore and Prime Evolve Singapore

5 NEW FACILITIES BROKE GROUND by Evonik Methionine SEA, Novabay Singapore, Unimatec Singapore, Cogent Jurong Island and Berstsch Singapore

AUTOMATED REVERSIBLE TRAFFIC FLOW SYSTEM enables efficient deployment for smoother traffic during peak hours
ONE-NORTH
INTEGRATED WORK-LIVE-PLAY-LEARN
RESEARCH AND BUSINESS PARK

Who’s There?

More than

400 companies
46,000 knowledge workers
16 public research institutes
5 institutes for higher learning and corporate universities

What’s New?

Completed Phase 2
JTC LaunchPad @ one-north
with the completion of 3 new blocks, is now home to close to 800 startups and 50 enablers

Expected completion in 2019
New flyover at Mediapolis
eases traffic congestion and enhances connectivity in one-north

one-north Rider shuttle service
enhances last mile connectivity within the estate

Inaugural one-north Festival
involved 46 partners and drew more than 6,000 participants
Imagine you’re online, shopping for clothes. A soft prom dress with a frilly lace collar catches your eye. You like the dress but don’t like the lace on the collar. If you’re in a shop, you can ask a shop assistant for help but that’s not an option when you’re surfing the web. Here’s where ViSenze steps in. The Singaporean startup company specialises in visual search, and customers on online fashion sites like Zalora use its technology to search for images of products. If you’re at a fashion e-commerce site, ViSenze’s technology can supply you with a helpful selection of similar products, so that you can narrow down your search and find the perfect little black dress for your big night out. This technology is not just restricted to fashion. ViSenze’s cutting edge solutions centre on image recognition and visual search, so there are many other potential applications for the technology, and other clients include Lazada, Sears, ASOS, Rakuten and Essilor.

ViSenze is currently located at JTC LaunchPad @ one-north, a hub for startups. Oliver Tan, 47, CEO of ViSenze, says his company has benefitted from being part of the tech ecosystem at LaunchPad. For example, the company gets to meet foreign guests who visit JTC LaunchPad, including foreign media, venture capitalists and potential clients. Mr Tan was particularly excited about the opportunity he had to meet with Harley Davidson’s US Director of Innovation. “He was amazed by the innovation and technology that we and other startups have at JTC LaunchPad,” Mr Tan says. “Being at JTC LaunchPad is great as it helps us get visibility through the guests and events it hosts.”

ViSenze first moved to JTC LaunchPad @ one-north in 2014, partly because of its connections to National University of Singapore (NUS). ViSenze was started based on technology research first developed by NUS scientists and they wanted to be located nearby. NUS was one of the first anchor tenants at Blk 71 of JTC LaunchPad and being a sub-tenant of NUS there gave ViSenze access to shared facilities and talents.
ViSenze chose to be at JTC LaunchPad because of the thriving startup community. “We like being together in a startup community,” Mr Tan says. “If we were in Changi or Woodlands, we would be out there on our own. There are reasons why startups like other startups. There’s the network effect. Apart from tech startups, other critical people and firms are drawn here, like venture capitalists, private equity firms, media, potential clients – you need all these ingredients for success.”

The presence of so many startups and related companies at JTC LaunchPad has created an ecosystem that greatly benefits ViSenze. “When you’re part of the JTC LaunchPad ecosystem, everybody knows everybody. The investors at LaunchPad have an eye out for promising startups, so when you’re neighbours, they can keep track of your progress. You can go out for coffee with them and in twenty minutes do a demo, which is better than going to Raffles Place in a suit to present to them.” Two of ViSenze’s investors are at Blk 71 – Walden International and Raffles Venture Partners. “The venture capitalists are at LaunchPad and they are very helpful people – even if you’re not suitable for them, they’ll refer you to others – there’s the networking effect.”

Being in the same place also makes it easier for startups to flourish together. “Startups like to help each other,” Mr Tan says. “I like to give back to the startup community in the same way I’ve benefited from them. We help each other along because we know how difficult the journey is. I believe in paying it forward. For example, I’ll introduce them to the right venture capitalists.”

Being at JTC LaunchPad has also helped ViSenze attract talent. “LaunchPad attracts millennials, who feel it’s a hip place to work with the good food and live bands at Timbre+. I always say food and brain cells go together, you cannot think without food. We can go to Timbre + for meetings and brainstorm work ideas over beer. When I give my namecard to people, often, they’ll say – ‘Oh, you’re at LaunchPad, that’s a cool place to work.’”

Companies at LaunchPad also come together to do recruitment fairs. “There’s the crowd effect at the LaunchPad career drive and I’ve managed to recruit about 10 people through the career fairs we have at LaunchPad.”

The media has also been drawn to covering JTC LaunchPad. “This gives us visibility,” Mr Tan says. “Startups have no advertising budget so the positive publicity and media recognition of JTC LaunchPad gives us free publicity.”

The Economist magazine was so impressed with LaunchPad that in 2014, it called it “the world’s most tightly packed entrepreneurial ecosystem.”
Creating Land and Space to Support the Growth of Industries

Completed Developments

JTC Aviation Two
@ Seletar Aerospace Park

GFA: 19,500 SQM

JTC Chemicals Hub
@ Tuas South

GFA: 26,300 SQM
Creating Land and Space to Support the Growth of Industries

JTC nanoSpace @ Tampines
GFA: 22,900 SQM

JTC Space @ Tampines North
GFA: 33,800 SQM

JTC Space @ Gul
GFA: 17,600 SQM

Blocks 75, 77 and 81 in JTC LaunchPad @ one-north
GFA: 16,400 SQM
UPCOMING DEVELOPMENTS

JTC LaunchPad
@ Jurong Innovation District
Completing Mid-2017
GFA: 5,300 SQM

JTC Food Hub
@ Senoko
Completing Mid-2017
GFA: 85,700 SQM
Creating Land and Space to Support the Growth of Industries

JTC Space @ Tuas
Completing 2018
GFA: 159,800 sqm

JTC Furniture Hub @ Sungei Kadut
Completing 2018
GFA: 68,400 sqm

JTC Logistics Hub @ Gul
Completing 2019
GFA: 144,800 sqm

TimMac @ Kranji
Completing 2020
GFA: 137,000 sqm
DEVELOPING NEXT-GENERATION ESTATES
JURONG INNOVATION DISTRICT
600-HECTARE INDUSTRIAL ESTATE OF THE FUTURE

Who and What to Expect?

Urban solutions, advanced manufacturing, smart logistics and related sectors

Innovators, makers and entrepreneurs

Nanyang Technological University and other research institutes

Completing Mid-2017
JTC LaunchPad @ Jurong Innovation District will support startups in industries such as engineering, advanced manufacturing and clean technology
PUNGGOL DIGITAL DISTRICT
50-HECTARE INTEGRATED BUSINESS DISTRICT

Who Will Be There?

- Digital and cyber security companies
- A vibrant community of knowledge workers, students and residents
- Singapore Institute of Technology
SUPPORTING THE PUBLIC SERVICE’S INFRASTRUCTURE NEEDS
CUSTOMS OPERATIONS COMMAND

Completing 2019
A purpose-built new Customs Operations Command with specialised enforcement facilities, an office block and a warehouse block for Singapore Customs.

MAXWELL CHAMBER SUITES

Completing 2019
The refurbishment of the red dot building supports the expansion of Maxwell Chambers, strengthening Singapore’s position as an international centre for dispute resolution.

STATE COURTS TOWERS

Completing 2020
The new State Courts Towers will house more than 60 courtrooms and over 50 hearing chambers to meet the needs of society, providing better access to justice and timely dispute resolutions.

Supporting 28 ONGOING PUBLIC PROJECTS

More than $5 BILLION in total value of projects

Supporting the Public Service’s Infrastructure Needs

More than $5 billion in total value of projects
DRIVING INNOVATION, PRODUCTIVITY AND SUSTAINABILITY
SELF-DRIVING VEHICLE TEST ROUTE @ ONE-NORTH
one-north’s pioneering test route enabled the world’s first trial of self-driving taxis.

LAUNCH OF THE CETRAN* TEST CIRCUIT AT CLEANTECH PARK
A first in South East Asia, the 2-hectare test circuit provides a simulated road environment to set regulations and certify self-driving vehicles.

*Centre of Excellence for Testing & Research of AVs – NTU
Driving Innovation, Productivity and Sustainability

82 ongoing innovative projects including applied R&D, test-bedding and pilot trials

45 sustainability projects

20 construction productivity projects

17 land intensification and optimisation projects
10 Companies awarded in our 2nd Innovation Call

Composite Cluster Singapore for its intelligent monitoring of mechanical systems such as air conditioning and ventilation

GoGo App for its smart ID access system that enables identity authentication via users’ smartphones

DNV-GL for its predictive lift maintenance technology that utilises sensors to schedule timely servicing and prevent breakdowns

SurePark for its smart parking app, with voice-enabled and hands-free navigation to available parking spaces

H3Dynamics for its building inspection solution that uses drone swarms powered by solar fuel cells

TechBridge Ventures for its energy-efficient ionisation system that allows users to customise air quality from their smartphones

ZA and Singnergy for their waste management solution that converts food waste into biomass and harmless gases with zero wastewater discharge

Surbana Jurong for its real-time facial recognition software that identifies personnel by scanning faces to grant secure access

WIS Holdings for its robots that improve the quality and consistency of cleaning
A construction method that prefabricates and completes modules with finishes, fixtures and fittings. The workers’ dormitories in JTC Space @ Tuas are constructed using PPVC.

Benefits

- Controlled manufacturing environment
- Reduces human error
- Minimises waste
STRUCTURAL STEEL

Fabricated off-site in a controlled manufacturing environment before transportation to site, structural steel ensures better quality control, enhances workers’ safety and improves construction productivity.

Blok 73 in JTC LaunchPad @ one-north received the BCA Construction Productivity Gold Award for its use of structural steel.

Benefits

10 to 15% more productive compared to using conventional reinforced concrete
Reduction in on-site construction work
Neater, cleaner and safer construction environments
MASS ENGINEERED TIMBER (MET)

MET was used as structural materials in the construction of Block 81 in Phase 2 of JTC LaunchPad @ one-north. The MET types used – cross laminated timber and glue laminated timber – are examples of productive construction materials used by JTC in its industrial infrastructure projects.

Benefits

- Easy plug-and-play installation
- Less noise and dust
- A cleaner and more organised worksite
DRIVING INNOVATION, PRODUCTIVITY AND SUSTAINABILITY

ENABLING FUTURE TECHNOLOGIES

QUICABOT
A quality inspection and assessment robot co-developed with Nanyang Technological University (NTU) and Transforma Robotics. It performs autonomous quality checks in construction projects, enabling greater efficiency in conducting architectural assessments.

Benefits
- **Cloud storage** allows for easy data retrieval from the cloud by builders and developers
- **Improved precision** as QuicaBot can pick out hard-to-detect defects
- **2x faster** than manual inspection
- **More productive inspections** especially in units with large gross floor areas

PICTOBOT
A spray-painting robot developed in collaboration with NTU and Transforma Robotics. It scans the environment and uses a precise spray-gun to ensure high quality painting.

Benefits
- **Improves workers’ safety** as the 13m high jack-up platform eliminates work-at-height risks
- **Ensures quality painting results** with its built-in scanner and precise spray-gun
- **4x faster** than manual brushing or rolling, using a six-axis robotic arm and computerised spray-paint trajectory
Since 2015, NTU and JTC have been working together to develop two robots – QuicaBot and PictoBot – for use in the construction industry.

QuicaBot – short for Quality Inspection and Assessment Robot – can be used to check for defects in buildings, picking up non-conformance such as cracks, uneven surfaces and walls that meet at angles that are out of square.

When human inspectors are checking whether walls meet at right angles and if floors are even, they use tools such as set squares and spirit levels. QuicaBot uses a laser scanner to capture 3D data of the room to check if the walls are properly aligned and even. QuicaBot also uses an inclinometer to check the slope of floors, a visual camera to pick up cracks in the building and a thermal infrared camera that uses heat to detect hollowness and hollow tiles.

It usually takes two human inspectors a day to finish inspecting a building. With QuicaBot, only one human inspector is needed and the inspection will only take half a day. QuicaBot can also inspect the building with greater accuracy and consistency than a human inspector. The robot can upload its 3D data into a database, meaning that all defects will have their locations, visual captures and detailed measurements recorded automatically. Data in the cloud can be directly accessed by builders and developers.

According to Professor Chen I-Ming, Director of the Robotics Research Centre at NTU’s School of Mechanical & Aerospace Engineering, and Co-Thrust Leader (Infrastructure Systems and Materials), JTC came to him with a real-world problem in the construction industry and challenged his team to come up with a solution. Since the beginning of the project in 2015, NTU worked with JTC’s experienced engineers and management to support the progress of the robot. “JTC gave us lots of feedback,” said Professor Chen. “They provided us with domain knowledge and helped us refine the features of the robot. When inspecting a building, there are many items we needed to check – BCA has a 70-page manual for this – so we had to figure out which can be done better by a human and which by a robot.”
When Professor Chen showed the robot to people in the construction industry, he received a positive response. “The industry people think this robot is very relevant. This project is different from some of our other projects, which is less applicable to industry.”

Professor Chen has been working with JTC since 2014, a partnership that naturally progressed from a National Research Foundation (NRF) task force created to address the problem of labour shortage and rising labour costs in the construction industry. “The construction industry is a very critical sector in Singapore and we held a workshop with JTC to look into this area. So our collaboration came at the right time, since we were both interested in solutions to enhance the productivity of the construction industry.”

NTU is testing QuicaBot at JTC Space @ Gul. “For this type of robot, you use it only at a very specific time, which is after completion of the architectural works of a building as a prerequisite prior to obtaining TOP (Temporary Occupation Permit) or CSC (Certificate of Statutory Completion),” said Professor Chen. “It’s a challenge finding a building that fits into that time frame. By testing the robot at a building with completed architectural works like JTC Space @ Gul, we can test the robot all year round instead of having to wait for a different building to be ready every time.”

Professor Chen says the next step for QuicaBot is to figure out how to commercialise the robot. “We also want to enhance its capability to check for more types of defects, such as leakage and uniformity of the colour or the paint,” he says.

The other robot that NTU and JTC is working together on is PictoBot, which can paint walls and ceilings up to 10 metres in height, making it ideal for industrial buildings.

PictoBot automatically scans its surroundings and navigates walls using an optical camera and laser scanner, moving up and down via an automated jack-up platform, while spray-painting the walls with its six-axis robotic arm.

Industrial buildings usually have high ceilings, which means that human painters are exposed to various safety risks while doing their job. PictoBot can paint a wall 25 per cent faster than a crew of two painters, thus improving productivity and safety. PictoBot can also be used in the dark, enabling continuous painting for 24 hours a day.

Professor Chen said that JTC provided his team with useful feedback, including inputs and requirements from the perspective of the industry when they were designing the robot. “JTC helped us improve the accessibility of the robot to the places it is designed to be used. For example, things like making sure that the robot could go through the door and fit into a lift. These are basic requirements but sometimes we can forget.”

Future steps for the development of PictoBot include creating a smaller version which can be used in offices and residences. “We’re also thinking of how we can use PictoBot for cleaning, designing it to spray water. If we can use the same robot to do different types of work, that would add more value to our product,” said Professor Chen.
**CONFLEXPAVE**

New bendable concrete that is stronger and lasts longer than regular concrete, co-developed with NTU at the NTU-JTC Industrial Infrastructure Innovation Centre.

**Benefits**

- **Durable**
  - with double the service life

- **Time saving**
  - cutting construction time by more than half

- **Manpower saving**
  - with 50% less manpower required

- **Reduces traffic congestion**
  - with less lane closure

**J-OPS**

An Integrated Smart Estate and Building Operations System that allows JTC to centrally and remotely monitor, analyse and optimise estate and building systems on the facilities management front. Pilots in three of our buildings have been completed, and the command centre is now up and running.

**How Does It Work?**

J-Ops leverages big data, analytics and sensors to provide insight into how building systems are operating. It alerts us to faults early, instead of waiting for a system to malfunction. This allows us to rectify any faults before the equipment or system fails and causes disruption or discomfort to our tenants.
DRIVING INNOVATION, PRODUCTIVITY AND SUSTAINABILITY

CHAMPIONING SUSTAINABILITY IN INDUSTRIAL INFRASTRUCTURE

6 DEVELOPMENTS were awarded the BCA Green Mark in FY2016
18 JTC BUILDINGS AND DISTRICTS in total have been certified and awarded the BCA Green Mark to date

The BCA Green Mark recognises the incorporation of international best practices in environmental design and performance in our developments.

2016 GREEN MARK AWARDS

JTC FOOD HUB @ SENOKO
GREEN MARK AWARD (PLATINUM)

Green Features:
• Strategically placed solar panels on the car park roof
• Full LED lighting in common areas
• Daylight, motion and carbon dioxide sensors
• No direct west-facing façade
• Green leases for tenants

FUSIONPOLIS @ ONE-NORTH
GREEN MARK AWARD (PLATINUM)

Green Features:
• Doubled-glazed, low-emissivity glass to allow for natural daylight
• Motion sensors for the sky bridge, escalators and car parks
• Fluorescent lamps with energy-efficient LED lights
• An estate management system to optimise energy usage

BIOPOLIS @ ONE-NORTH
GREEN MARK AWARD (GOLDPLUS)

Green Features:
• Energy-efficient LED lights in all blocks
• NEWater usage for cleaning and irrigation
• Electric or hybrid car park lots in every block
OASIS @ SAKRA ON JURONG ISLAND
GREEN MARK AWARD (PLATINUM)

**Green Features:**
- Sun shades and low-emissivity glass to improve the building’s thermal performance
- Air curtains at food court entrances
- Carbon dioxide and temperature sensors to minimise energy consumption
- Energy-efficient luminaires and downlights to minimise lighting power usage
- Automated smart meters for water management and leakage detection

JTC SPACE @ TAMPOINES NORTH
GREEN MARK AWARD (GOLD PLUS)

**Green Features:**
- Passive design that maximises natural ventilation
- Energy-efficient LED lights
- Green leases for tenants
- PUB excellent-rated fittings that reduce water consumption
- Sustainable building and construction materials and methods

JTC SPACE @ GUL
GREEN MARK AWARD (GOLD PLUS)

**Green Features:**
- Minimised west-facing façades
- Energy- and water-efficient fittings
- Solar photovoltaic system
- Green roof
- Environmentally-friendly construction materials such as low volatile organic compound paints, pre-cast wall panels and prefabricated bathroom units
FINANCIAL HIGHLIGHTS AND REVIEW
FINANCIAL HIGHLIGHTS AND REVIEW

OVERVIEW

FINANCIAL RESULTS

FY2016 saw JTC Group continue to report a healthy performance. The Group achieved an operating revenue of $1.9 billion and turned in a surplus, after contribution to consolidated fund and taxation, of $1 billion.

Operating revenue remained flat at $1.9 billion, comprising mainly land and building rental income. Other income grew to $0.8 billion, primarily boosted by gain on disposal of investment properties. Expenditure hovered at $1.5 billion and the Group ended the year with a net surplus of $1 billion.

In line with the Group’s continuing effort to develop industrial infrastructure to catalyse the growth of new industries and transform existing enterprises, a total of $1.7 billion was invested in capital expenditure in FY2016. The capital expenditure was incurred mainly for building developments and the purchase of industrial land.

FINANCIAL POSITION

The Group’s financial position remains strong with $20 billion in equity.

As at 31 March 2017, total assets stood at $26 billion. This was a 3% increase from the previous year, largely due to ongoing investments in land and building developments. Investment properties, property, plant and equipment as well as other receivables accounted for 68% of total assets.
## Group Financial Highlights

### Financial Highlights

<table>
<thead>
<tr>
<th>For the Year ($'Mil)</th>
<th>FY2016</th>
<th>FY2015</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating revenue</td>
<td>1,957</td>
<td>1,953</td>
<td>0.2%</td>
</tr>
<tr>
<td>Non-operating income</td>
<td>826</td>
<td>410</td>
<td>101%</td>
</tr>
<tr>
<td>Net surplus</td>
<td>1,071</td>
<td>1,307</td>
<td>-18%</td>
</tr>
<tr>
<td>Capital expenditure</td>
<td>1,725</td>
<td>1,504</td>
<td>-15%</td>
</tr>
</tbody>
</table>

Net Surplus $1,071 Mil -18%

### Financial Position

<table>
<thead>
<tr>
<th>At Year End ($'Mil)</th>
<th>FY2016</th>
<th>FY2015</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment properties</td>
<td>13,371</td>
<td>12,706</td>
<td>5%</td>
</tr>
<tr>
<td>Total assets</td>
<td>26,170</td>
<td>25,440</td>
<td>3%</td>
</tr>
<tr>
<td>Total borrowings</td>
<td>459</td>
<td>480</td>
<td>-4%</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>5,500</td>
<td>5,839</td>
<td>-6%</td>
</tr>
<tr>
<td>Total equity (excluding non-controlling interest)</td>
<td>20,670</td>
<td>19,601</td>
<td>5%</td>
</tr>
</tbody>
</table>

Total Equity $20,670 Mil +5%

### Key Financial Ratios

<table>
<thead>
<tr>
<th>FY2016</th>
<th>FY2015</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt-equity ratio (%)</td>
<td>2.2%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Interest coverage (times)</td>
<td>148.7%</td>
<td>120.9X</td>
</tr>
<tr>
<td>Return on total assets (%)</td>
<td>4.2%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Return on capital employed (%)</td>
<td>5.3%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Value added per employee ($'Mil)</td>
<td>1.8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

5.3% -1.3% Return on Capital Employed
FINANCIAL REVIEW

OPERATING REVENUE

Distribution of Group’s Operating Revenue

FY2015
- Land and building rental income: 90%
- Income from port operations: 8%
- Other operating revenue: 2%

FY2016
- Land and building rental income: 90%
- Income from port operations: 7%
- Other operating revenue: 3%

OPERATING EXPENSES

Distribution of Group’s Operating Expenses

FY2015
- Loss in recoverable amount of investment properties: 44%
- Depreciation: 18%
- Other expenses: 11%
- Employee compensation: 11%
- Maintenance and conservancy: 10%
- Property tax: 5%
- Finance expenses: 1%

FY2016
- Loss in recoverable amount of investment properties: 34%
- Depreciation: 18%
- Other expenses: 18%
- Employee compensation: 12%
- Maintenance and conservancy: 11%
- Property tax: 6%
- Finance expenses: 1%
Financial Highlights and Review

Capital Expenditure, Assets and Liabilities

Group Capital Expenditure ($ Mil)

<table>
<thead>
<tr>
<th></th>
<th>FY2016</th>
<th>FY2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Land and building development</td>
<td>753</td>
<td>583</td>
</tr>
<tr>
<td>Others</td>
<td>907</td>
<td>871</td>
</tr>
</tbody>
</table>

Total Assets ($ Mil)

<table>
<thead>
<tr>
<th></th>
<th>FY2016</th>
<th>FY2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other assets</td>
<td>26,170</td>
<td>25,440</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>30,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Investment in associate and joint ventures</td>
<td>20,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Investment properties</td>
<td>15,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Capital, Reserves and Liabilities ($ Mil)

<table>
<thead>
<tr>
<th></th>
<th>FY2016</th>
<th>FY2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital and reserves</td>
<td>26,170</td>
<td>25,440</td>
</tr>
<tr>
<td>Deferred income</td>
<td>30,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Borrowings</td>
<td>20,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Other liabilities</td>
<td>15,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>
A World Leader in Multipurpose Port Operations
In FY2016, Jurong Port made significant strides towards its vision of being the premier next generation multipurpose port. Despite challenging circumstances in the offshore marine and construction sectors that have impacted demand in key commodities such as steel and cement, the momentum in various transformation initiatives has continued to gain traction. Of note, the port will be proceeding with its investment in a new joint venture, Jurong Port Tank Terminals, and will expand its suite of multipurpose port capabilities to handle liquid bulk storage. Our overseas portfolio has also been resilient and growth plans remain on track. In particular, there have been strong performances in our Rizhao and Marunda joint ventures, as well as encouraging new cargo opportunities for the Yangpu joint venture.

The transformation of a new operating model for general cargo has reached key milestones. Jurong Port successfully operationalised and integrated a stevedore workforce consisting of close to 400 stevedores in the port. We have also rolled out a new business partnership for steel cargo handling with our stevedore company partners. We are ensuring a sustainable improvement in labour and general cargo handling productivity by implementing greater mechanisation and automation. This includes the newly set-up Jurong Port Academy that will ensure the upskilling and professionalisation of the port workforce, as well as the introduction of new handling equipment such as sideloaders for steel cargo.

In FY2017, our transformation initiatives at home will continue to be the main focus as Jurong Port strives to build and deepen our core competencies, pursue organisational excellence and secure future business growth. The roll-out of our new operating model will continue in FY2017.
CORE COMPETENCIES

Cement Productivity

▲ 15.8% cement productivity through operators’ productivity tracking, dual unloading and increased equipment reliability.

▲ 1.5 million tonnes of throughput capacity with the Cement Terminal 1 Upgrade. Expected completion in October 2017.

Steel Productivity

▲ 11.4% above target with the introduction of new handling methods and equipment such as 100 grade 10 tonne chains, to handle cargo from cargo hold to wharf, with the ability to lift 30% more bundles of deformed bars.

General Cargo (upgrade of berths J10 and J11)

▲ 2x capacity from 35,000 dwt to 70,000 dwt

▲ 3 tonnes/sqm wharf loading, from 3 tonnes/sqm to 6 tonnes/sqm

▲ 7,000 sqm of yard space

▲ 4.4 m of draft depth, from 9.1 m to 13.5 m

3Cs – Competency, Culture, Compliance

3-year safety transformation journey to strengthen our Workplace, Safety and Health (WSH) competency for better operations supervision in alignment with our role as a proactive port operator.

Developing the Next Generation Multipurpose Port

$8 million MPA-Jurong Port MOU marks both organisations’ commitment towards funding initiatives over a 5-year term to reinforce efforts to transform Jurong Port into a next generation multipurpose port.

Sideloader

▲ 17% labour productivity with the custom-designed sideloader, deployed for efficient handling and transportation of steel cargo within the port. The improved operational productivity will also reduce vessel turn around time.

BCA Green Mark Award

Jurong Port received the BCA Green Mark Award in recognition of our ‘green berths’, which have been operational since September 2016.
LOCAL GROWTH

**General Cargo**
- Throughput volume: 6.4 million tonnes
- Volume change: 18%

**Bulk Cargo**
- Throughput volume: 7.7 million tonnes
- Volume change: 14%

**Containers**
- Throughput volume: 315,000 TEUs
- Volume change: 3%

**Lighter Terminal**
- Throughput volume: 0.83 million tonnes
- Volume change: 4%

**Offshore Marine Centre**
- Throughput volume: 0.03 million tonnes
- Volume change: 52%

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**Launch of Combi Terminal**
A one-stop terminal for vessels carrying a combination of containers and general cargo; the Combi Terminal handles both types of cargoes efficiently, safely and seamlessly with the use of quay cranes.

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**Jurong Port Tank Terminals**
Achieved positive Final Investment Decision (FID) with joint venture partner Oiltanking in FY2016. Construction has commenced in July 2017.

- Draft of up to **17.6 m**
- **4 Deep Water Berths**
- **16 Hectares** of Land
- Estimated Storage Capacity of **470,000 cbm**
- Accommodate Vessels of up to **180,000 dwt**
- Product Transfer Rates from **1,500 cbm to 3,000 cbm** per hour
OVERSEAS GROWTH

RIZHAO
Shandong, China
12.3 million tonnes
Throughput volume
14%

Demand for soybean and other grains remains strong in China.

MARUNDA
Jakarta, Indonesia
2.5 million tonnes
Throughput volume
38%

YANGPU
Hainan, China
4.3 million tonnes
General & Bulk Cargo Throughput volume
16%

Continues to attract new cargo sources such as hemlock logs and cater to increasing construction demand requirements in Hainan.
ORGANISATIONAL EXCELLENCE

Launch of Jurong Port Academy
Located at the Devan Nair Institute for Employment and Employability (e2i), the academy is part of the port’s efforts to transform the multipurpose port industry by leveraging new technology and innovation to enhance capabilities, increase productivity and upskill port workers.

JP Academy comprises:
- Classroom-Based Learning
- Simulator Training
- Training Yard

Learning Council formed to guide the academy comprises:
- Senior Leadership Team
- National Transport Workers’ Union (NTWU)
- Representatives from Stevedore Companies

Corporate Social Responsibility
Our CSR strategy focuses on the environment, our people and the community.

Coastal Clean-Up
This is an annual activity since 2015, where we play our part to clean up Singapore’s waterways.

“Kids Day Out”
In collaboration with South West CDC, Jurong Port staff organised a day-out activity for 20 underprivileged kids during the March holidays.

Blood Donation
This initiative with regular staff donors supports efforts by the Singapore Red Cross Society to meet national blood bank requirements.

SPD Ability Fun Walk
In partnership with SPD, Jurong Port was the main sponsor for their inaugural Ability Fun Walk event which was an opportunity for staff to participate and interact with beneficiaries.

Rebranding
Jurong Port underwent a rebranding exercise which has shaped our new visual identity across the suite of corporate and marketing communications collaterals, including our corporate website.

Our brand promise: Rely On Us
Committed to our national role, we are focused on efficiency, safety and sustainability as we continue to evolve as a port you can count on. We are Singapore’s next generation multipurpose port operator.
CORPORATE ACHIEVEMENTS

National Infocomm Awards 2016

Winner, "Most Innovative Use of Infocomm Technology"
Private Sector - Open Category
This award was for the enhancement to Jurong Port’s main access gate integrating various technologies in a smart approach towards infocomm applications.

- Achieving a single-touch experience for port users while enhancing security
- Reduction in processing time 60%
- Minimise vehicle waiting time

National Safety and Security Watch Group Award 2016

Outstanding Individual Award
This award, conferred by the Singapore Police Force and Singapore Civil Defence Force, recognises corporations who take ownership and practice a proactive approach towards safety and security.

May Day Awards 2017

Medal of Commendation
Conferred to CEO Ooi Boon Hoe
Jurong Port CEO Ooi Boon Hoe was nominated by NTWU for his commitment to improve staff welfare and for building a close working relationship with members of the union.

Partners Award
Conferred to Jurong Port
Jurong Port was nominated by e2i for its efforts in changing the profile of port workers through training, which helps develop them into professionals who are future-ready for a full-fledged career in a multipurpose port.

ICA Departmental Awards 2017

Commissioner’s Commendation Silver Award
Jurong Port’s commitment and collaborative efforts led to the formulation of improved baseline security measures for land-based sea cargo checkpoints’ access points. For this achievement, Jurong Port received the Commissioner’s Commendation Silver Award.