Industrial 4.0
Smart Manufacturing Platform

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Chief Operating Officer
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Company Overview

Since its inception in 2000, ViTrox designs and manufactures innovative, leading-edge and cost effective automated vision inspection equipment and system-on-chip embedded electronic devices for the semiconductor and electronic packaging industries. Today, we serve more than 300 customers in 22 countries.

Financial Background

<table>
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<th>Shareholders' Equity:</th>
<th>RM262 M (USD 60M)*</th>
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<th>Market Capitalization:</th>
<th>RM1.2 Billion (USD272Mil)*</th>
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<td>*(As of April 2017)</td>
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Workforce

<table>
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<th>450 Headcount (Malaysia)*</th>
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<th>30 Headcount (Global – China, Taiwan, Philippines, USA &amp; others)*</th>
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Stock Exchange Listing

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<th>Established in 2000</th>
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Since its Inception in 2000, ViTrox designs and manufactures innovative, leading-edge and cost-effective automated vision inspection equipment and systems - on-chip embedded electronic devices for the semiconductor and electronic packaging industries. Today, we serve more than 300 customers in 22 countries.
Achievements

- No. 1 3D in-line AXI
- 150 AXIs sold since 3 years
- 800 AOIs sold since 4 years
- 15,000 vision systems installed, No. 1 Turret Base Vision Solutions!
- 12 Patents Filed
- 60 Corporate / Product Awards won in 10 years
- 20 countries
- 255 customers worldwide
- 15% revenue invested in R&D every year
Industrial 4.0
Industrial 4.0

Industrial 4.0 or “Smart Factory”, in which cyber-physical systems monitor the cyber physical processes of the factory and make decentralized decisions. The physical systems become Internet of Things, communicating and corporating both with each other and humans in real-time via the wireless web.
Disruptive Technologies

A number of disruptive technologies will enable digitization of the manufacturing sector

Digitization of the manufacturing sector – Industry 4.0

- Big data/open data
  - Significantly reduced costs of computation, storage, and sensors
- Internet of Things/M2M
  - Reduced cost of small-scale hardware and connectivity (e.g., through LPWA networks)
- Cloud technology
  - Centralization of data and virtualization of storage

- Data, computational power, and connectivity

- Analytics and intelligence
  - Digitization and automation of knowledge work
    - Breakthrough advances in artificial intelligence and machine learning
  - Advanced analytics
    - Improved algorithms and largely improved availability of data

- Human-machine interaction
  - Touch interfaces and next-level GUIs
    - Quick proliferation via consumer devices
    - Virtual and augmented reality
      - Breakthrough of optical head-mounted displays (e.g., Google Glass)

- Digital-to-physical conversion
  - Additive manufacturing (i.e., 3D printing)
    - Expanding range of materials, rapidly declining prices for printers, increased precision/quality
  - Advanced robotics (e.g., human-robot collaboration)
    - Advances in artificial intelligence, machine vision, M2M communication, and cheaper actuators
  - Energy storage and harvesting
    - Increasingly cost-effective options for storing energy and innovative ways of harvesting energy

SOURCE: McKinsey
Next Horizon of Operational Effectiveness

- New value potential created by eliminating inefficiencies across the "digital thread".
- Paradigm shift from optimizing physical assets to optimising how data and information are leveraged along the product lifecycle.

**Disruptive technologies increase the value of digital information along the entire product lifecycle**

The digital thread is the digital representation of the physical product lifecycle.

**Physical product lifecycle**
- Research and design
- Source
- Make
- Distribute
- Service
- End of life

**Digital thread**
- End-to-end information flow across lifecycle

4 activities are required to manage the digital thread:

- **Information capturing and recording**
  - Relevant set of data to prevent information overflow
  - Automated, real-time capturing via sensors
  - Recording and storing of both historical and new data in a single information system

- **Information transfer**
  - Digitally transfer information across departments, production sites, value chain steps, and company borders

- **Information analysis and synthesis**
  - Identification of relevant data and analysis (ideally, automated)
  - Synthesis of analysis into relevant insights

- **Turning information into outcomes**
  - Translation of analysis results into recommendations that suggest actions for workers or automatically trigger actions of machines
  - Feedback and continuous improvement

*SOURCE: McKinsey*
McKinsey Digital Compass

- Help identifying and prioritize optimization opportunities.
- Paradigm shift from optimizing physical assets to optimising how data and information are leveraged along the product lifecycle.
McKinsey Digital Compass

- Service/aftersales
- Resource/process
- Asset utilization
- Labor
- Quality
- Inventories

- Time to market
- Supply/demand match
- Data-driven design to value
- Data-driven demand prediction
- Digital quality management
- Advanced process control (APC)
- Statistical process control (SPC)
- Batch size 1
- Real-time SC optimization
- In situ 3D printing
- Automation of knowledge work
- Digital performance management
- Remote monitoring and control
- Human-robot collaboration
- Augmented reality for MRO
- Predictive maintenance
- Remote monitoring and control
- Machine flexibility
- Routing flexibility
- Real-time yield optimization
- Intelligent IoTs
- Smart energy consumption
- Virtually guided self-service
- Remote maintenance
- Rapid experimentation and simulation
- Concurrent engineering
- Customer co-creation/open innovation

ViTrox
Manufacturing in Industrial 4.0

Industrial 3.0 Manufacturing

LOCAL AREA NETWORK

Customized Automation
(Island Automation)

Flexible Automation

Industrial 4.0 Manufacturing

SMART MANUFACTURING CONNECTIVITY PLATFORM

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Manufacturing in Industrial 4.0

Industrial 3.0 Manufacturing

LOCAL AREA NETWORK

Customized Automation
(Island Automation)

- Local Control Unit
- Sensor Group
- Sensor

Industrial 4.0 Manufacturing

SMART MANUFACTURING CONNECTIVITY PLATFORM

Flexible Automation

- Local Control Unit
- Sensor Group
- Sensor

ViTrox

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A Smart factory tool at your fingertip, visualize, respond and proactively predict the inspection results in various stages of the production lines making your process indicators live both pre and post inspections and giving the capability to control the production process in a smarter way with less time and resources.
V-ONE Smart Manufacturing Platform

Single Line in Local Network Solution

V-ONE to Industry 4.0

The Smart Manufacturing's Next Act

Connection to V-One via MES or direct

COLLECT
Automatically Collect Machine Data

VISUALIZE
Machine Utilization and OEE Dashboard

PROACT
Data Standardization and Auto Fine-Tuning

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V-ONE

Connect the inspection machines in SMT lines to monitor their performance on a real-time basis.

1. Collect:
   Automatically Collect Machine Data

2. Visualize:
   Machine Utilization and OEE Dashboard

3. ProAct:
   Data Standardization and Auto Fine-Tuning
V-ONE Smart Manufacturing Solution
Scalable Data Structure

Multiple AOI Pools

Multiple AXI Pools

MySQL

AOI VDSPC Server

MySQL

AOI VDSPC Server

MySQL

AOI VDSPC Server

MySQL

AOI VDSPC Server

MySQL

AXI VDSPC Server

MySQL

AXI VDSPC Server

MySQL

AXI VDSPC Server

MySQL

AXI VDSPC Server

V-ONE Server

PostgreSQL

VTS

VTS

VTS

VTS

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**V-ONE Features (1 / 5) - Dashboard**

**Dashboard**

A fully flexible and configurable dashboard that allows users to configure dashboards suitable for their process needs. Machine status, call rate, yield, chart analysis, floor plan, machine utilization, machine error, and etc. are able to be viewed even in a single dashboard.
Dashboard Use Model - 1

Production Line Performance Monitoring

Use Model:
Line information in one page
Summary auto reporting
Dashboard Use Model - 2

AOI Machine Performance Monitoring

AXI Machine Performance Monitoring
Dashboard Use Model – 3: Machine Utilization
Dashboard Use Model - 4: Yield
Data Analysis

a fully configurable SPC tools for user to analyze machine data in more efficient way. Real time SPC allows user to monitor the performance and re-act on production defect instantly.
V-ONE Data Analysis Use Model (Example - 1)

Line cross machine monitoring

Use Model:

- Visualize different machine process indicator
- Monitor and alert to react in real time.
Machine Status Monitoring

a machine monitoring window to track machine activities in real time basis. Machine sensors activities will be tracked and Machine Utilization can be computed automatically in real time.
V-ONE Features (3/5) - Use Model

Machine Utilization Tracking

Use Model:

- Machine activities problem tracking
- Daily MU auto reporting
- Trend and Optimization
Remote Control

Allow user to remote control to the machine PC via web.
V-ONE Features (4/5) - Remote Control
V-ONE Features (5/5) - Alert Triggering

Alert Triggering

A fully flexible and configurable triggering module allow user to configure different use model to help production automate monitoring process in real time basis.
Feature 5/5 - Alert Triggering Use Model

Production Model A inspection data send to V-ONE

- Escalate to management if not resolve in time frame
- Technician alert via SMS/email
- Engineer fine tuning:
  - Machine fine tuning
  - Remote NOLP fine tuning

High false call for Board Model A
How SME can benefit from V-ONE Smart Manufacturing Platform
V-ONE SMART MANUFACTURING PLATFORM

1. Collect: Automatically Collect Machine Data
2. Visualize: Machine Utilization and OEE Dashboard
3. ProAct: Data Standardization and Auto Fine-Tuning

End-to-end information flow across lifecycle
Conclusion

- From big data to **smart data** for **value** creation.
- Data-driven **predictive maintenance**
- Automation & human-machine **collaboration**
- Digitized **advanced process control**
- **Interoperability** & standardization.
- Combination of **analytic** and diagnostic with **People**.
- Increase **productivity** through **connected digital** enterprise.
- Reduced cost and scalability.
THANK YOU