I. XAVIS INTRODUCTION

• Company Overview (XAVIS)
• Technology and Development
• Products
Company Overview

- Xavis is an acronym for **X-ray Automatic Vision Inspection System**, which gives an idea of its business model and goal as well as products identity.

- Xavis was established on April 6, 2002 and celebrated its 17th anniversary this year. Xavis started with just 2 members, but now has grown to 70 employees. Xavis has been solely devoted to researching, developing and manufacturing x-ray inspection systems for various industries, including: food, pharmaceuticals, Electronic parts, Machinery/Car parts, Die casting, Batteries, Circuit boards and Mountings, Semiconductors, etc.

Applications

<table>
<thead>
<tr>
<th>Food</th>
<th>Pharmaceuticals</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Food Image" /></td>
<td><img src="image2" alt="Pharmaceuticals Image" /></td>
</tr>
<tr>
<td><strong>Automotive/Die casting</strong></td>
<td><strong>Battery</strong></td>
</tr>
<tr>
<td><img src="image3" alt="Automotive/Die casting Image" /></td>
<td><em>(EV, Polymer, Prismatic, Cylindrical)</em></td>
</tr>
<tr>
<td><strong>PCB/FPCB/SMT</strong></td>
<td><strong>Semiconductor</strong></td>
</tr>
<tr>
<td><img src="image4" alt="PCB/FPCB/SMT Image" /></td>
<td><img src="image5" alt="Semiconductor Image" /></td>
</tr>
</tbody>
</table>
Company Overview

Organization

President

Administration Department

Marketing Department
- Domestic Sales Team
- Overseas Sales Team
- Global Marketing Team

Customer Service Team

Production Department
- Production & Quality Team

Purchasing Team

3D X-Ray R&D Center
- Design Team
- SW/OS Team A
- SW/OS Team B
- Inspection Team
- Electrical Component Team

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Company Overview

Company History

- Xavis has demonstrated continuous sales growth as well as regular expansion of its product range since its establishment in 2002. This has been acknowledged and recognized by many governmental authorities and public organizations.
- Xavis was listed in Konex, the third largest Korean stock market in 2015, and aims to move into the next market level, Kosdaq, in this year.

**2002~2006**
- April 2002 Xavis Co., Ltd. established
- Sep 2003 Certified ISO9001 & KS A9001
- Nov 2003 Designated as a venture company
- Sep 2004 Introduced Korea’s first industrial CT scan equipment
- Sep 2004 Certified as a Frontier company
- Apr 2005 CE certified
- Jun 2006 Designated as a blue-chip (Korea Technology Credit Guarantee Fund)

**2007~2010**
- Jun 2007 Awarded the Minister’s Awards by the Ministry of Science and Technology (National Industry Development category)
- Oct 2007 Selected as a Promising Small to Medium Exporter
- Oct 2008 Received a commendation as an excellent small to medium company in Gyeonggido
- Jan 2009 Selected as a Star Company in Seongnam
- Sep 2009 Patent applied for the x-ray inspection equipment
- May 2010 Patents applied for 4 equipment pieces, including the high speed chip CT inspection equipment

**2011~2018**
- Nov 2015 Listed in KONEX
- Apr 2014 Awarded a commendation award by the Ministry of Science and Technology
- Jul 2012 FCC, FDA certificate
- Oct 2011 Awarded the Minister’s Prize in the 12th annual packaging equipment by the Ministry of Knowledge Economy
- Aug 2011 Won a contract for high-precision development equipment for Samsung Electronics
- Sep 2018 Selected as IBK Best Champion Partner
- May 2018 Development of 300ppm of Cylindrical Battery Inspection System
- Jun 2016 Selected as a first level of Global Hidden Champion by SMBA
Company Overview

XAVIS New Factory
Xavis is selling its products to more than 40 countries worldwide, and has been a top seller in the Korean market for many years.
References

Food industry

Electronics industry
Technology & Development

Core Technologies

- Xavis machines are built on three core technologies that form the foundation of its business and product offerings. Xavis machines provide X-ray application technology that is non-destructive, provide outstanding image processing with our machine vision, and allow for motion and robot control with automation technology.

- Nano (0.1μm/0.4μm/0.6μm)
- Micro (1μm/5μm/33μm/300μm)
- Open/Closed Tube Control
- X-ray safety design
- Oblique CT (3D X-ray)
- Line Scanning Technology

- 3D Design
- Inline Automation
- Servo (Robot) Control
- PC Control
- PLC Control
- Smart Learning

- Computed Tomography
- 3D Reconstruction
- Auto Inspection (AXI)
- Vision Image Processing
- Dual Energy Image processing
R&D and Technology

Producing the best products is the constant and ongoing goal of Xavis. To that end, Xavis invests the biggest dedicated portion of its resources in research and development. R&D staff comprises about 40% of the total manpower, and Xavis invests more than 13% of its sales revenue into R&D every year.

[Focus of human resources on R&D]

[Investment on R&D, compared to revenue]

Certificate

Xavis’s machines are certified with major industry regulating agencies, including CE, FCC and UL for global customers.
# Products Overview

Xavis has 2 categories of products line. XSCAN series for industrial use and FSCAN series for Food inspection.

- **XSCAN** product lines are designed to inspect the quality of electronic parts: if there is any "cold soldering joint" or defect or disconnection of "gold-wire bonding" in any electric parts, any void or crack in automobile or die-casted parts, and to measure the distance between electrodes in a battery to prevent any possible explosion.

<table>
<thead>
<tr>
<th>Applicable Industry</th>
<th>Semi-conductor</th>
<th>Automobile parts</th>
<th>Battery</th>
<th>Die-casting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Products/ check points</td>
<td><img src="image1.png" alt="PCB" /></td>
<td><img src="image2.png" alt="Wheel" /></td>
<td><img src="image3.png" alt="Battery" /></td>
<td><img src="image4.png" alt="Die-casting" /></td>
</tr>
<tr>
<td>▪ Cold soldering joint</td>
<td>▪ Void, crack</td>
<td>▪ Anode-Cathode Distance</td>
<td>▪ Void, crack</td>
<td></td>
</tr>
<tr>
<td>▪ Gold wire bonding defect</td>
<td>▪ Dimensions</td>
<td></td>
<td>▪ Dimensions</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td><img src="image5.png" alt="XSCAN A Series" /></td>
<td><img src="image6.png" alt="XSCAN-H Series" /></td>
<td><img src="image7.png" alt="XSCAN-4500" /></td>
<td><img src="image8.png" alt="XSCAN-9000" /></td>
</tr>
<tr>
<td></td>
<td><img src="image9.png" alt="XSCAN-8000" /></td>
<td><img src="image10.png" alt="XSCAN-9860" /></td>
<td><img src="image11.png" alt="XSCAN-4500" /></td>
<td></td>
</tr>
<tr>
<td>Photo</td>
<td><img src="image12.png" alt="XSCAN-A Series" /></td>
<td><img src="image13.png" alt="XSCAN-H Series" /></td>
<td><img src="image14.png" alt="XSCAN-4500" /></td>
<td><img src="image15.png" alt="XSCAN-A Series" /></td>
</tr>
</tbody>
</table>

- **FSCAN** series are for locating foreign materials or contaminants in processed food.

<table>
<thead>
<tr>
<th>Applicable Industry</th>
<th>Applicable Products/ check points</th>
<th>Model</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td><img src="image16.png" alt="SPAM" /></td>
<td><img src="image17.png" alt="FSCAN 3280 series" /></td>
<td><img src="image18.png" alt="FSCAN 3280 series" /></td>
</tr>
<tr>
<td></td>
<td>Existence/ size of foreign material</td>
<td><img src="image19.png" alt="FSCAN 4280 series" /></td>
<td><img src="image20.png" alt="FSCAN 4280 series" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image21.png" alt="FSCAN 6500 series" /></td>
<td><img src="image22.png" alt="FSCAN 6500 series" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image23.png" alt="FSCAN 9500 series" /></td>
<td><img src="image24.png" alt="FSCAN 9500 series" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image25.png" alt="FSCAN 2080/2500" /></td>
<td><img src="image26.png" alt="FSCAN 2080/2500" /></td>
</tr>
</tbody>
</table>
# Products Overview

## FSCAN Series Line up - Standard

<table>
<thead>
<tr>
<th>Model</th>
<th>3280</th>
<th>4280</th>
<th>4500</th>
<th>6280</th>
<th>6500</th>
<th>9500</th>
<th>2080</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photos</td>
<td><img src="image" alt="Image of 3280" /></td>
<td><img src="image" alt="Image of 4280" /></td>
<td><img src="image" alt="Image of 4500" /></td>
<td><img src="image" alt="Image of 6280" /></td>
<td><img src="image" alt="Image of 6500" /></td>
<td><img src="image" alt="Image of 9500" /></td>
<td><img src="image" alt="Image of 2080" /></td>
<td><img src="image" alt="Image of 2500" /></td>
</tr>
<tr>
<td>Belt width (mm)</td>
<td>420</td>
<td>420</td>
<td>420</td>
<td>620</td>
<td>620</td>
<td>1,000</td>
<td>250</td>
<td>350</td>
</tr>
<tr>
<td>X-ray output</td>
<td>100W</td>
<td>100W</td>
<td>480W</td>
<td>100W</td>
<td>480W</td>
<td>480W</td>
<td>100W</td>
<td>480W</td>
</tr>
<tr>
<td>Inspectable products size</td>
<td><img src="image" alt="Image of 3280" /></td>
<td><img src="image" alt="Image of 4280" /></td>
<td><img src="image" alt="Image of 4500" /></td>
<td><img src="image" alt="Image of 6280" /></td>
<td><img src="image" alt="Image of 6500" /></td>
<td><img src="image" alt="Image of 9500" /></td>
<td><img src="image" alt="Image of 2080" /></td>
<td><img src="image" alt="Image of 2500" /></td>
</tr>
<tr>
<td></td>
<td>237mm</td>
<td>200mm</td>
<td>389mm</td>
<td>573mm</td>
<td>583mm</td>
<td>954mm</td>
<td>250mm</td>
<td>350mm</td>
</tr>
<tr>
<td></td>
<td>180mm</td>
<td>200mm</td>
<td>389mm</td>
<td>573mm</td>
<td>583mm</td>
<td>954mm</td>
<td>250mm</td>
<td>328mm</td>
</tr>
<tr>
<td>Applicable products</td>
<td>Small pouch</td>
<td>Medium sized package</td>
<td>Large package</td>
<td>Bulky package</td>
<td>Canned or bottled products</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Products Overview

Why is XAVIS special?

- **What makes Xavis special?**
  As a developer and manufacturer of x-ray inspection systems, Xavis produces all products in its facility in Korea, and provides a complete solution to customers from design to after service. Furthermore, Xavis provides customized solutions to meet the needs of each customer.

- **Xavis provides total solution**
  → Research, development, manufacturing, sales, customer service, after service

- **Proven technology**
  → Xavis developed the first industrial 3D X-ray inspection system in Korea

- **Work for Customers’ satisfaction**
  → Xavis provides customized hardware & software solution for each customer
  → Patented "Smart Learning"

Why is XAVIS products special?

- As product samples pass through the systems, Smart learning feature enables the machines to automatically set standards for classifying products as good or no good. This process relieves the burden of a worker to set each parameter value of NG standard manually.
- Xavis is very flexible and customer oriented. Xavis listens to customer requests and provides customized solutions according to each customer's line condition and production situation.

  **Smart Learning – Auto Parameter Setting**
  - Pass dozens of good samples of product through Xavis X-ray inspection machine
    → Xavis X-ray machines automatically sets the standard of Good/No good classification
  - Customers are relieved from the burden to set each parameter value of NG standard manually

  **Customization**
  - Four lane inspection
  - Multi Input (conveyor & Tube in-line)
  - Customized X-ray Tube & Detectors & Rejecters
  - Customized Masking System
  - Customized Algorithm
Products Overview

Pipeline Inspection System

- The Pipeline system can inspect fluid products and semi-solid products which are produced through pipelines.
- Higher detection rate of foreign bodies can be expected as this system inspects raw materials before they are packaged in Aluminum, glass or plastic package.
- Customers do not need to extract and repack defective products, so they can reduce packaging and processing costs.
- It features a hygienic design and can be cleaned with water with IP66 compliance, and easy separation of the pipeline from the main machine.

Features
- Contamination detection in pumped food products
- Pipe type
- HACCP support
- Simple cleaning
- Wash-down
- Flow direction change
- Easy to operate touch screen control panel
- Durable, sanitary design
- User friendly operation

Application example

< Good: Pipe x-ray image > < NG: Pipe x-ray image with glass >
Products Overview

Seal damage inspection

- The sealing inspection system is for detecting foreign substances inside a sealing area.
- A conventional system can't detect product wrapping, because the density of a wrapper is very low, but sealing inspection system has a high resolution detector and can check the quality of the wrapping of a product made of vinyl or thin plastic.

Features
- High resolution detector system
- Easy cleaning
- Variable belt speed
- User friendly operation

Application example

Improve detecting ULTRA low-density contaminants
- For detecting contaminants in sealing area
- Advanced inspection and high technology
- Reliability in food safety inspection

Why inspects sealing?
Any contaminants in sealing area can causes mold (bacteria) to grow as the sealing is not complete.
Products Overview

Pearl inspection

- The pearl inspection system can detect the existence of a pearl and measures the size of pearl without opening the shell.

Features
- Maximum inspection quantity per minute is 65 pcs
- Tolerance ± 0.05mm
- Hygienic design
- IP66 compliance
- User friendly operation
- Brand protection

Application example

- Good
- Bad – smaller size
Products Overview

Pharmaceutical Inspection

- Xavis FSCAN x-ray system is used for pharmaceuticals industry as well.
- The x-ray system can detect cracking, partial damage, or lack of pills and the quantity of pills in a package.

Detection of Damage, Empty for Pill

Count Inspection

Good

Half Damage

Blank

Partial Damage

NG

Good

10 / 10

NG

9 / 10

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II. XAVIS Strong Point
**XAVIS Strong Point**

1. Specialty

Only One Specialized X-ray Inspection System Company with high resolution technology based on three core technology for Food & Industrial Products (Semiconductor, Battery, Automotive, Die Casting & SMT, PCB, FPCB).

2. Proven Technology

The 1st development of 3D X-ray Inspection System in Korea and XAVIS products (more than 2,000 units) are running at five business fields in worldwide Food & Industrial markets.
XAVIS Strong Point

3. Smart Learning System

XAVIS machines automatically sets up its parameter value of good/not good product as standard with AI program.

4. R&D Investment

To lead the market & develop high technology products, 40% out of all employee are R&D people and invest 13% from sales revenue for high advanced new technology.

5. Customization

To meet various customer’s request, XAVIS does not only develop customized product but also modify software & hardware for customer’s satisfaction.
6. High Speed

In processing of development & production, XAVIS takes fast & accurate action and provides 6Sigma level quality control.

7. Sensitivity

Nano Inspection Technology provides highly sensitive to both metallic and non-metallic contaminants.

8. High Reliability

Certificates including ISO9001, CE, UL, FCC, Compliance with FDA regulations give you confidence in its reliability and global XAVIS partners deliver the best quality & service through it.
9. User Friendly Operation

Designed to facilitate maintenance easy cleaning system and release stressful works from parameter value of Good/No Good Products.

![Easy Cleaning and Tool-Less Conveyor Replacement System.](image)

10. Customer’s Brand Protection

Customers will trust the products and the food is free of foreign substance and safe to eat.

XAVIS X-ray system saves customer’s cost due to no products recalls and consumer’s complaints.
Smart learning System (Auto Parameter Value Setting)

Smart Learning function
User-friendly Operation and Safety Design

Easy to clean
And remove parts for maintenance

Safety mechanism:
(Hand insertion sensor)
Real Time Network Monitoring System

Using an Ethernet connection to your office desktop, a real time report can be sent continuously to your computer for instant and constant monitoring of the quality control inspection.

Report items
- Machine status (run or stop)
- Production information (Total, NG count)
- View NG images
- View and save dairy production history

X-RAY MACHINE
Status: Running
Total: 1,500
NG: 35
NG rate: 2.33%

< Remoted Head office >
Real Time Online Support

Xavis engineer can access your machine remotely via Internet and directly troubleshoot to assist with problem situations.
※ For access, it needs Internet connection by the customer.

Support items
- Check hardware status
- Checking x-ray image quality
- Adjust sensitivities, settings
- Upgrade x-ray program

<Remote access program>
Ⅲ. GLOBAL BUSINESS with XSCAN PRODUCTS
III. XAVIS Business

1. Battery Inspection System
Battery Inspection System (Xscan-9200)

The World Best High Speed Battery Inspection System with Patent!

Model#: The Cylindrical Battery In-Line X-Ray Inspection System

Xscan-9200
1) XAVIS Battery Business Performance

<table>
<thead>
<tr>
<th>Type</th>
<th>Cylindrical</th>
<th>Pouch Polymer (EV)</th>
<th>Polymer &amp; Prismatic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In-Line</td>
<td>Off-Line</td>
<td>In-Line</td>
</tr>
<tr>
<td>Qty</td>
<td>21</td>
<td>43</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In-Line</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

1. Main Clients: LG Chemical, Samsung SDI, EVE, DFD, Ten Power, KOEM, etc
2. Some of the Off-Line X-Ray System include CT&3D function.

2) XAVIS Strong Point

① Differentiate inspection Area: Whole upper & Whole lower Inspection Area
   * Competitors: Half Area inspection of Upper, Lower

② Ultra High 400 PPM (Part Per Minute) response through differentiation of method in high PPM
   * Competitors: 350PPM
### 3) Product Line-Up

<table>
<thead>
<tr>
<th></th>
<th>Cylindrical</th>
<th>Prismatic</th>
<th>Polymer</th>
<th>EV/ESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Line (2D)</td>
<td><img src="9000/9120/9130/9150/9200/9300" alt="Image" /></td>
<td><img src="9100S/9120S/9180S" alt="Image" /></td>
<td><img src="9040S/9035L" alt="Image" /></td>
<td><img src="9012B/9048EV/9050EV" alt="Image" /></td>
</tr>
<tr>
<td>Off-Line (2D, CT&amp;3D)</td>
<td><img src="A100R/A130H/A150/7100CP/7130CP/7650CT&amp;3D/8225BCT&amp;3D" alt="Image" /></td>
<td><img src="A100R/A130H/A150/7100CP/7130CP/7650CT&amp;3D/8225BCT&amp;3D" alt="Image" /></td>
<td><img src="A100R/A130H/A150/7100CP/7130CP/7650CT&amp;3D/8225BCT&amp;3D" alt="Image" /></td>
<td><img src="A100R/A130H/A150/7100CP/7130CP/7650CT&amp;3D/8225BCT&amp;3D" alt="Image" /></td>
</tr>
</tbody>
</table>
Battery Inspection System (Xscan-9200)

4) Inspection Image

Upper Area Inspection

Lower Area Inspection
Battery Inspection System (Xscan-9200)

5) Inspection Image

[Image of inspection system interface with annotations for upper, lower, and center pin areas]
2. Semiconductor Automatic Inspection System
Semiconductor Inspection System(Xscan-9860)

The 1st Development & Unique of Full Inline 2D & 3D X-ray Inspection System in the world and its Flip Chip Inspection Market is Big!

Model#: Semiconductor Automatic X-ray Inspection System Xscan-9860
Semiconductor Inspection System(Xscan-9860)

1) Flip Chip Bump Inspection System

**BENEFIT**

- The 1st Development of Full Inline 2D & 3D X-ray Inspection System in the world and no competitors!
- Minimizing End User’s Claim
- Process Monitoring in Production line
- Increasing Business Opportunity with High Quality Product
- Saving Labor Cost
- More Economical Inspection System
- High Quality Product with 6Sigma

Patented!
Semiconductor Inspection System(Xscan-9860)

2) Flip Chip Bump Inspection System

2D & 3D Full In-line Flip Chip Bump Inspection X-ray System for Non-wet, Soldering Defect(Short, Missing)
3) 2D Inspection Images

[2D Short, Missing Detection Image]
4) 3D Inspection Images

Non-Wet (Snowman), 3D

[CT Non-wet Detection Image]  [3D Reconstruction Image]
5) 3D Void Inspection Images – Side & Top View

[3D Rendering Image] [3D Cross Sectional Image]
Semiconductor Inspection System (Xscan-H160)

The World 1st Void Automatic Measurement Software for CT & 3D Image!

Model#: Semiconductor Manual X-ray Inspection System

Xscan-H160
Semiconductor Inspection System (Xscan-H160)

1) CT Reconstruction & 3D Volume Rendering Measurement Process

X-Ray Machine with CT Ability

360° Object Scan

Rotation Images Collection

CT Image Centering by CT Software

Measurement & Defect Analysis

Feature Extraction & CAD Compare

3D Graphic Reconstruction
Semiconductor Inspection System (Xscan-H160)

2) 3D Volume Rendering Image

[CT Image]

Non-wet, Crack, Void
2) 3D Cross Sectional Image

[3D Cross Sectional Image]
4. PCB/SMT Inspection System
Xscan-A130 Inspection System

The 1st Development for Easy Operation & Measurement with Dual Monitor!

Model#: PCB/SMT X-ray Inspection System
Xscan-A130
1) 2D Inspection Images

- NG Image by Non-wet
- NG Image by Void
- NG Image by Short
- NG by No Component
- NG by Over-Lead
- NG Image by Crack
Xscan-A130 Inspection System

2) 3D Inspection Images

3D Rendering Images
Xscan-A130 Inspection System

3) 2D Voids Automatic Inspection & Measurement

Defect Recognition

Auto Functions
Quality Control

1. Certificate

- Xavis’s machines are certified by CE, FCC and UL for Quality

2. Craftsmanship

- All of Xavis products produced by Craftsmanship and monitored for customer service
Thank you

X-ray Automatic Vision Inspection System

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