SWIR in Machine Vision: Enabling Industrial Process Improvements

EPIC MEETING, VISION 2022

Xenics
Infrared Solutions

Agenda

- Xenics:
  - who we are
  - what we do in SWIR
  - where we are
- SWIR: a major benefit for Industrial Machine Vision
  - Application
  - Key parameters
- What’s next: trends for the future for Industrial Machine Vision

Xenics: Who we are

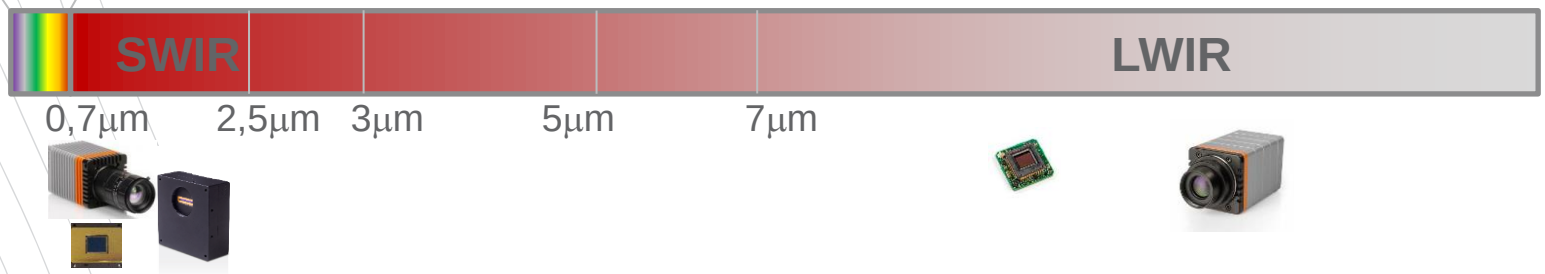
"Xenics a supplier of leading-edge infrared solutions"

Large portfolio (10 product families) covering different applications including:

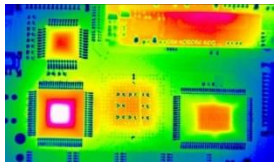
- Highest speed linescan SWIR
  - 2k pixels, 256kHz
- Highest speed 2D array SWIR
  - VGA 1,7kHz
- One-stop shop for 2D SWIR:
  - SXGA small pitch
  - VGA high sensitivity
  - QVGA cost optimized
- Ultra SWAP VGA LWIR:

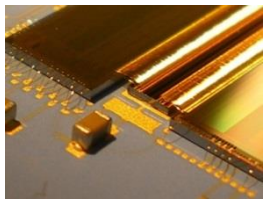
Visible

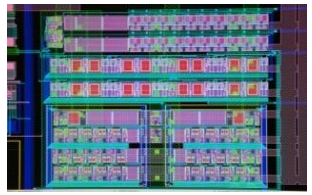
"Xenics designs and delivers several integration blocks"

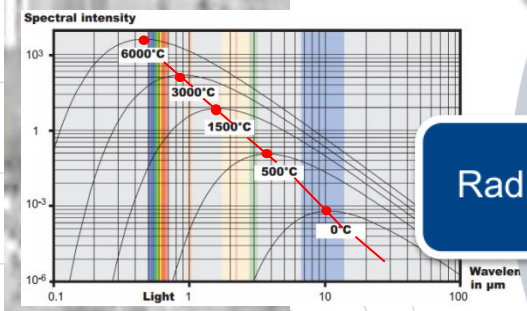


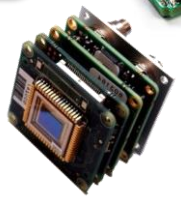
Xenics: Who we are

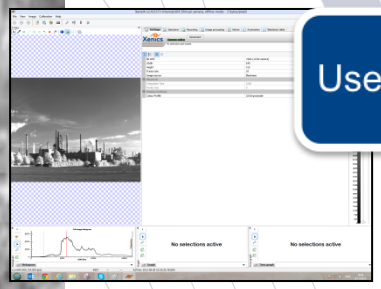












Detector technology

ROIC design

Electronics

Mechanics

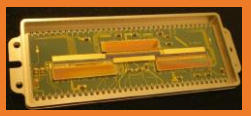
Embedded software

User software

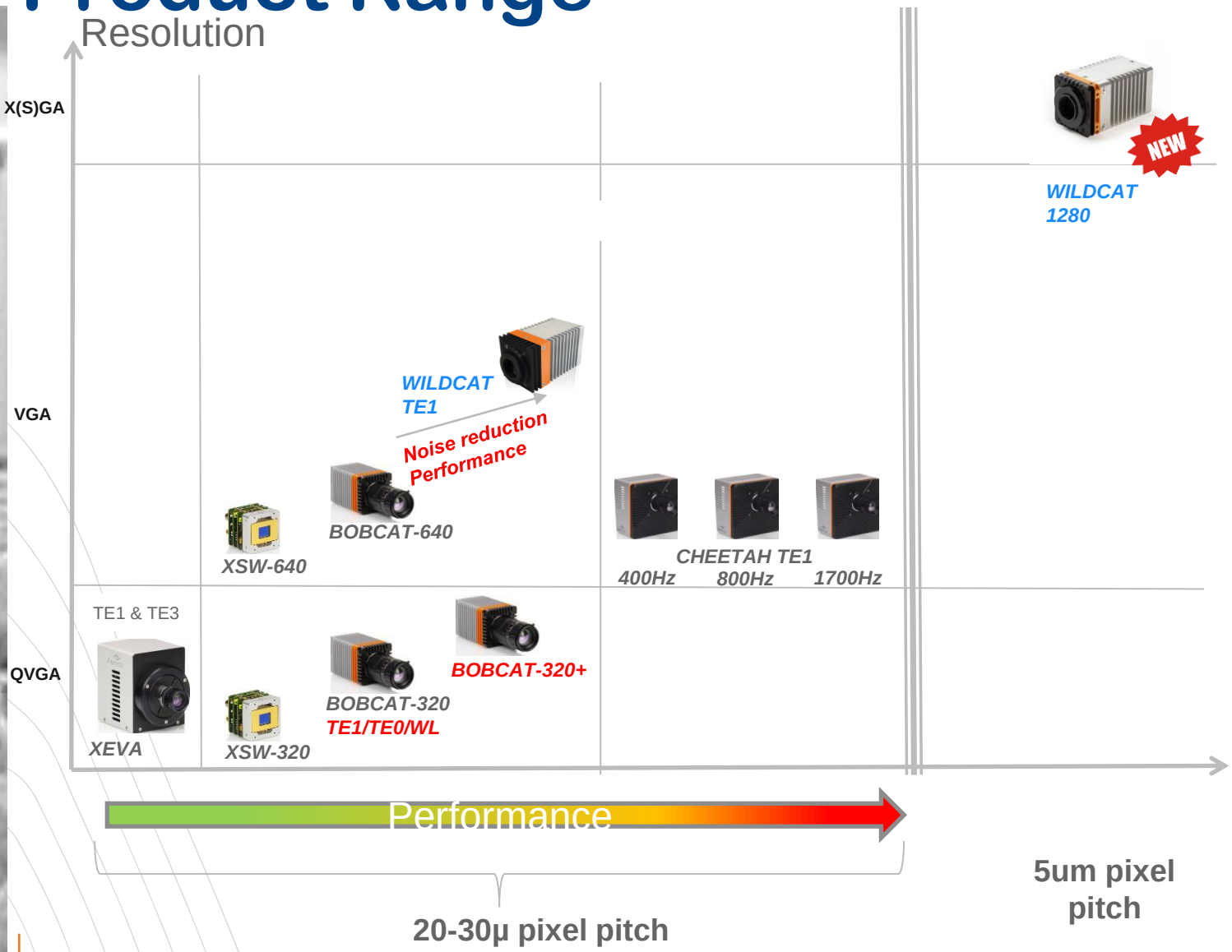
Radiometry

Image enhancement

Xenics: What we do in SWIR
1D Product Range

	SQ 25x25µ or 12,5x12,5µm 512-1024-2048 SQ 1700nm	R 12.5x250µm 512-1024-2028 R 1700nm	
Gen III Manx FC	**High speed: 260kHz / Low noise / CXP** Food/waste optical sorting Quality inspection, SC, Glass	OCT, OFM, Spectroscopy	 
Gen II Lynx / XSL WB	**Compact, low power & cost** Food/waste optical sorting Quality inspection, Glass		 
Gen I XLIN 1000 XLIN 3000	**Space sensors**		

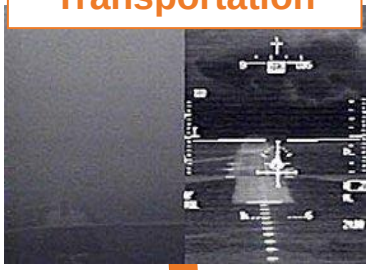
Xenics: What we do in SWIR 2D Product Range



Xenics: Where we are

Safety & Security

Transportation



Medical

Scientific and research

Process Monitoring

Machine Vision

SWIR: a major benefit for Industrial Machine Vision

See Inside

SWIR can see through silicon

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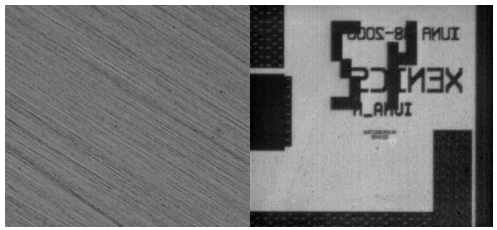
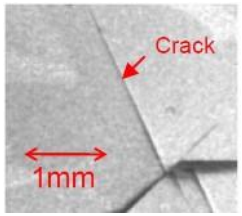
Sensitivity
Resolution



Visible camera SWIR Wildcat camera



Credit: Lars Johnsen, SINTEF ICT, Norway

SWIR OCT to inspect first layers of chips: OCT

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High resolution
Speed

Medical: OCT, Fluorescence

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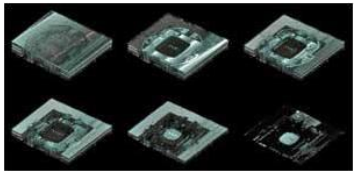
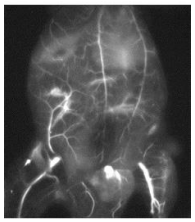
High Speed
Sensitivity
Resolution
Speed



Source: National Physical Laboratory



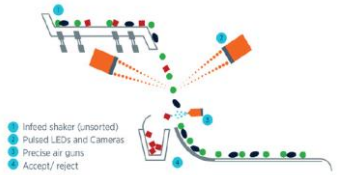
www.an.shimadzu.co.jp/bio/sai-1000.htm

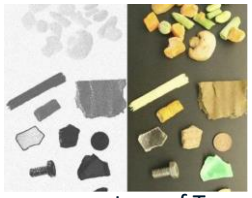
SWIR: a major benefit for Industrial Machine Vision

See What

Food sorting and processing

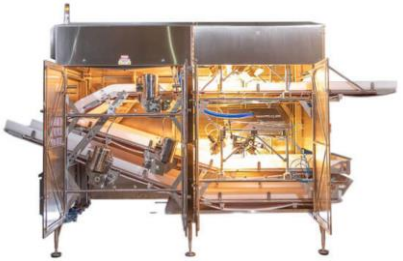
Imaging

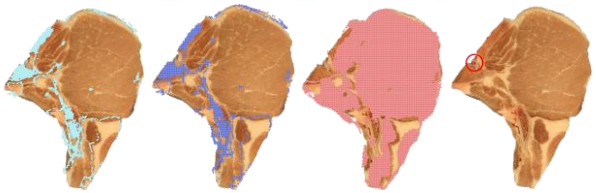




(Image courtesy of Tomra.)

Hyperspectral





(Image courtesy of P&P Optica.)

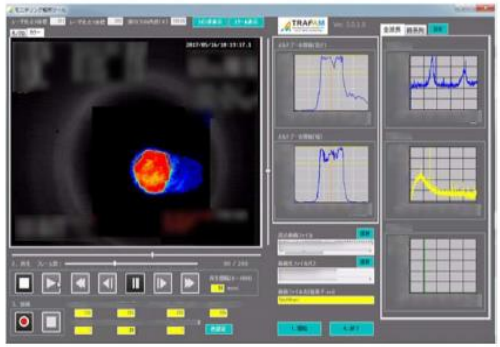
Recycling

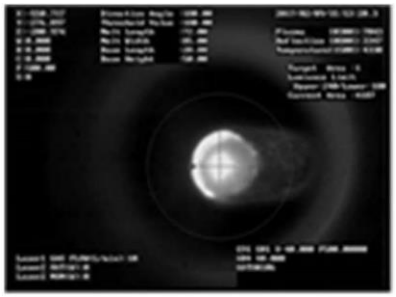
Image from CTR

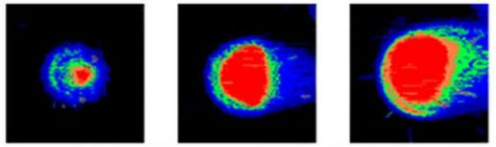
SWIR: a major benefit for Industrial Machine Vision

See High temperature

Additive manufacturing

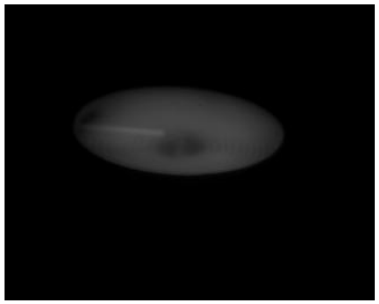






Condition 1 (low laser output) Condition 2 (intermediate laser output) Condition 3 (high laser output)

Glass inspection



Key parameters: Sensitivity

- Goal: small/low-contrast details detection
- Depends on
  - Amount of light detected: increase with pixel size
  - Internal noise of the detector
- Normalized sensitivity: Pixel size/ROIC Noise ratio
  - 15µm pixel size, 30 e-: NS= 7,5
  - 12,5µm pixel size, 25 e-: NS= 6,5!
  - 20µm pixel size, 45 e-: NS= 8,89!
- Small is not always beautiful!
- It all depends on light budget!

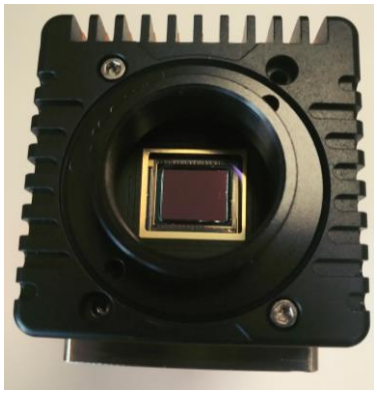
Key parameters: Speed

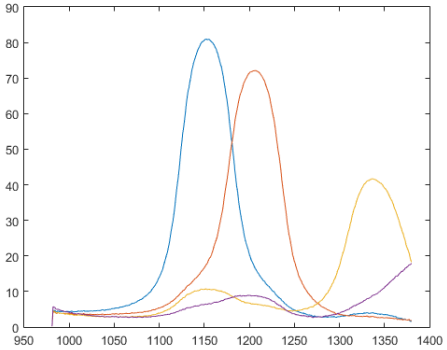
- Goal:
  - Increase throughput
  - Freeze movements
  - Perform real-time monitoring

- Current state of the art:
  - Linescan:
    - *260kHz on 2048 pixels line (Manx)*
    - *Allows high speed scaning systems*
  - 2D:
    - *1700Hz on VGA (Cheetah)*

What's next

- High resolution with high sensitivity and high speed
- Multispectral (embedded filters)





- Increase cut-off wavelenght >1,7µm
- Additional intelligence on the sensor or on the camera
- Different form factor (not only line or 4/3)

THANK YOU !

Please come to our booth 10E55