COMPLETE SOLUTION
FOR **NDT/NDE**

30

YEARS

ATG

NDT Solutions
with ADR

Introduction

ADR (Automatic Defect Recognition) systems enable automatic illumination, capture, detection and measurements of surface defects (indications) detected on metallic parts by different NDT methods such as:

- VT: Visual Testing
- MPI: Magnetic Particle Inspection
- FPI: Fluorescent Penetrant Inspection

Our company, Advanced Technology Group (ATG Ltd.) develops and manufactures their own systems and offers solutions which are tailor made according to the customer's requirements (e.g. inspection method, inspection takt, tested part shape, etc.).

Artificial intelligence (AI) systems digitizes testing and thanks to high speed of evaluation, are ready to replace the operators for testing of part's quality and reach higher productivity and reliability than operators which may be influenced by factors such as daytime, length of shift and other externalities.
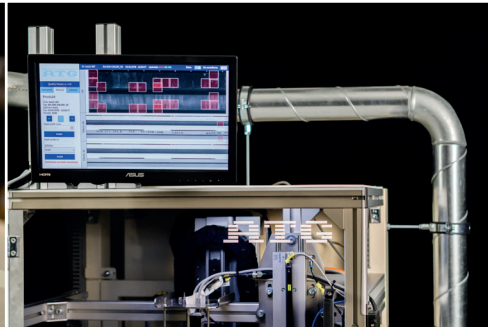

iVT systems

iVT systems allow detection of what a human operator may see and recognize, which usually includes wrong signatures of parts, scratches, pressure marks, corrosion, porosity, non-wrought parts or burnouts, cracks, wrong dimensions, wrong assembly, presence of foreign objects etc.
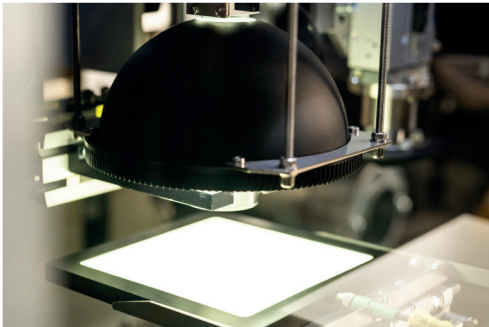
System iVT-B1 for inspection of bearing rings

iVT-B1

Surface defect

iMT systems

iMT systems (intelligent Magnetic Testing) offer semi-automated or fully automated magnetic particle inspection.
These systems allow assessment of presence, type, position and size of indications, which is a challenge itself due to complexity of shape, background level and other. ATG Group resolved this problem thanks to long-time experience in NDT of its staff that was reflected during implementation with modern and unique hardware and software (deep learning).

- Parts unloading and loading into the magnetizer (robotic or cartesian manipulation)
- Automatic magnetisation / demagnetisation, system settings and testing (TEST Plan PRO)
- Manipulation with the parts (robotic or cartesian manipulation)
- Capturing up to 100% of the tested surface as grayscale image data using special machine vision systems to limit false indications
- Special ATG machine vision UV light (ISO 3059)
- Automatic defect recognition from image data by AI
- Measurement of relevant indications and evaluation according to given standards
- Reporting systems, database, SCADA
- Sorting of OK / NOK parts
- Connection into MES / ERP

NOK detection

iPT systems

iPT systems (intelligent Penetrant Testing) offer fully automated fluorescent penetrant inspection lines.

- Parts unloading and loading into the FPI line
- Capturing up to 100% of the tested surface as grayscale image data using special machine vision systems to limit false indications
- Special ATG machine vision UV light (ISO 3059)
- Automatic defect recognition from image data by AI
- Measurement of relevant indications and evaluation according to given standards
- Reporting systems, database, SCADA
- Sorting of OK / NOK parts
- Connection into MES / ERP

Types of detectable defects

Indications common to FPI methods
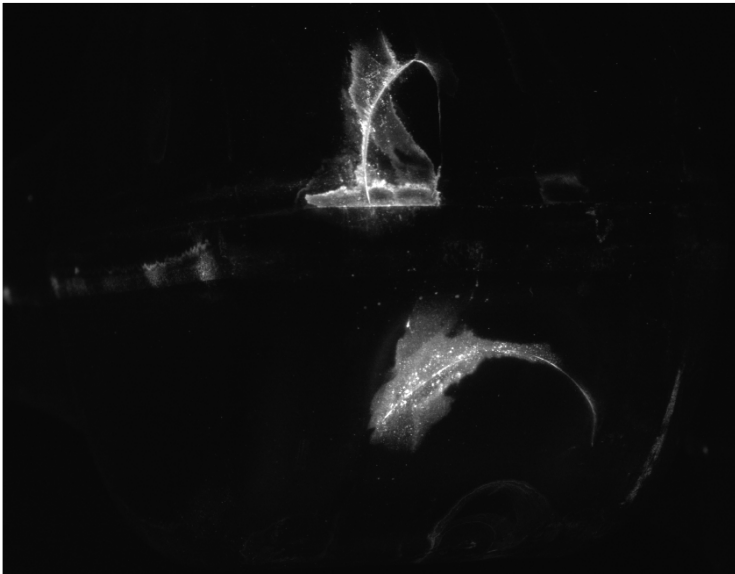
Defects common to MPI methods
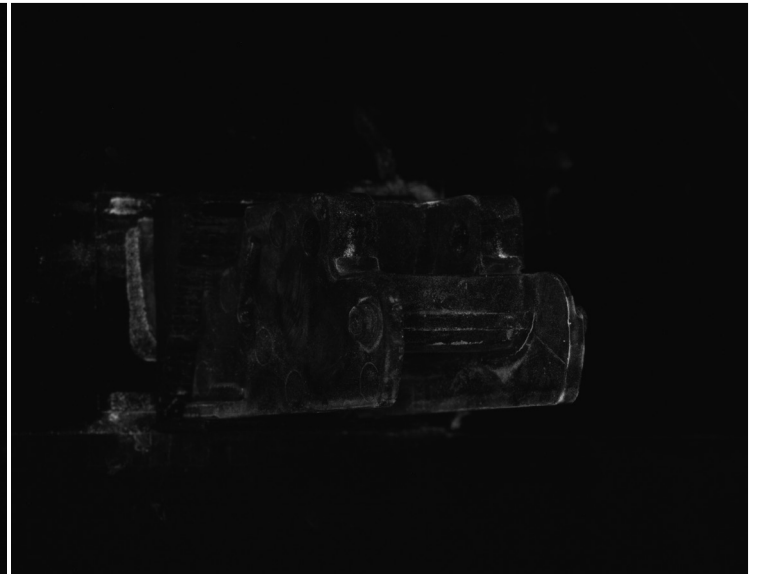

Sizes of detectable indications:

- Registration level of main indication or defect dimensions typically reaching 0.1 mm
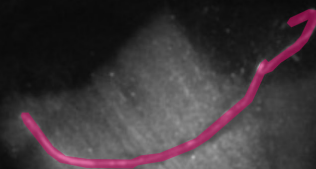- Indication registration level is conditioned by the surface roughness

Evaluation

Evaluation speed is the same or better than operators. Especially on larger areas the ADR systems provide significant advantages. Evaluation process takes a few seconds. The tact of the whole process depends on the complexity of the part (standard around 10 sec.)

Complexity increases with complexity of parts and complexity of its surface and roughness. For that reason the suitable candidates for automation with ADR are mass produced parts with higher surface quality, where the expenses associated with deep learning process and cost of equipment are lower and thus the return on investment may be reached sooner.
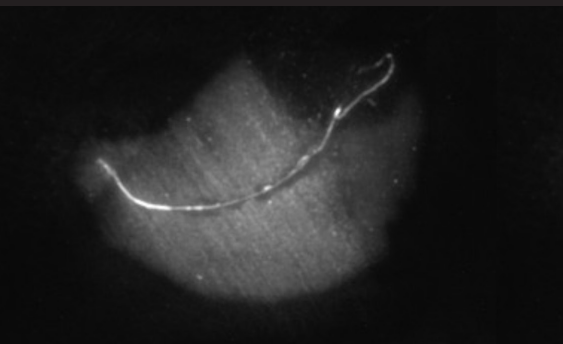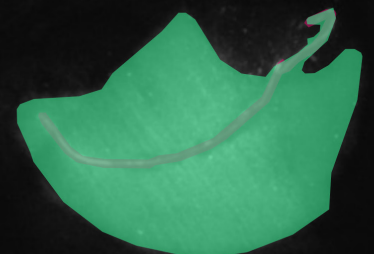

INDICATION | INDICATION MASK | PENETRANT AREA MASK

Implementation process

1

Feasibility study (FS)

a. Customer contacts ATG with requirements and information about tested parts

b. Customer sends a set of OK / NOK parts to ATG for an inspection, ATG performs FS

- test of NDT method
- test of robotic manipulation
- test of vision system
- test of AI defect detection

2

Implementation of semi-automatic ADR system in customer production line

a. System only takes and saves image data

b. System can suggest which indications correspond to defects, final decision is on human operator

c. Human operator required (company or ATG support)

- Control image data quality
- Control results of NDT inspection on image data
- Annotate defects on image data
- Collected image data are used for new AI model training
- Until required success rate of defect recognition is achieved (usually 95%)

3

Implementation of fully automatic ADR system

Implementation of fully automatic ADR system

a. After AI system performs better than a human operator or required success rate is achieved

b. Decision process to sort OK / NOK parts is given to ADR AI

Return on investment is usually in the range from 1 to 3 years depending on the testing actions to be performed on the given part, labor cost in the area of installation and also current productivity of existing processes.

Key benefits of our ADR solutions

- Fast inspection of up to 100% of the part surface
- Robotic manipulation of the parts or camera systems
- Robotic loading into VT, MPI / FPI process
- Unloading of the part from the MPI / FPI process for subsequent inspection
- Higher productivity and reliability than human operators
- Sorting of OK and NOK parts, or indecisive parts for inspection by a human operator
- Classification of parts according to the types of defects
- Recording statistics regarding the number of detected indications / defects, types of indications / defects of the number of OK / NOK parts
- Regular inspection of the capability of the camera system - standardization
- Customized solution tailored to a specific part/series of parts
- 24/7 operation
- Fast return of investment
- The possibility of integrating the system into the corporate network, MES and SCADA systems, including reporting on statistics and immediate feedback

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