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# Non-destructive Inspection Services For Digitally Enhanced Zero Waste Manufacturing

Taking advantage of digitally enhanced zero-waste  
manufacturing

Manufacturing Partnership Day, Brussels, 26 September 2023

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Funded by the  
European Union

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# Introduction

## The NEED for ZDZW

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Conventional quality control methods

Based on destructive techniques

Amounts of waste

Reduces productivity

Non-destructive techniques to address this limitations

- High acquisition cost
- Complexity of their technical and digital integration

To solve that

ZDZW

Develop advanced inspection technologies compatible with digital enabled manufacturing processes, using advanced AI-techniques



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# Introduction

## Objectives and ambition

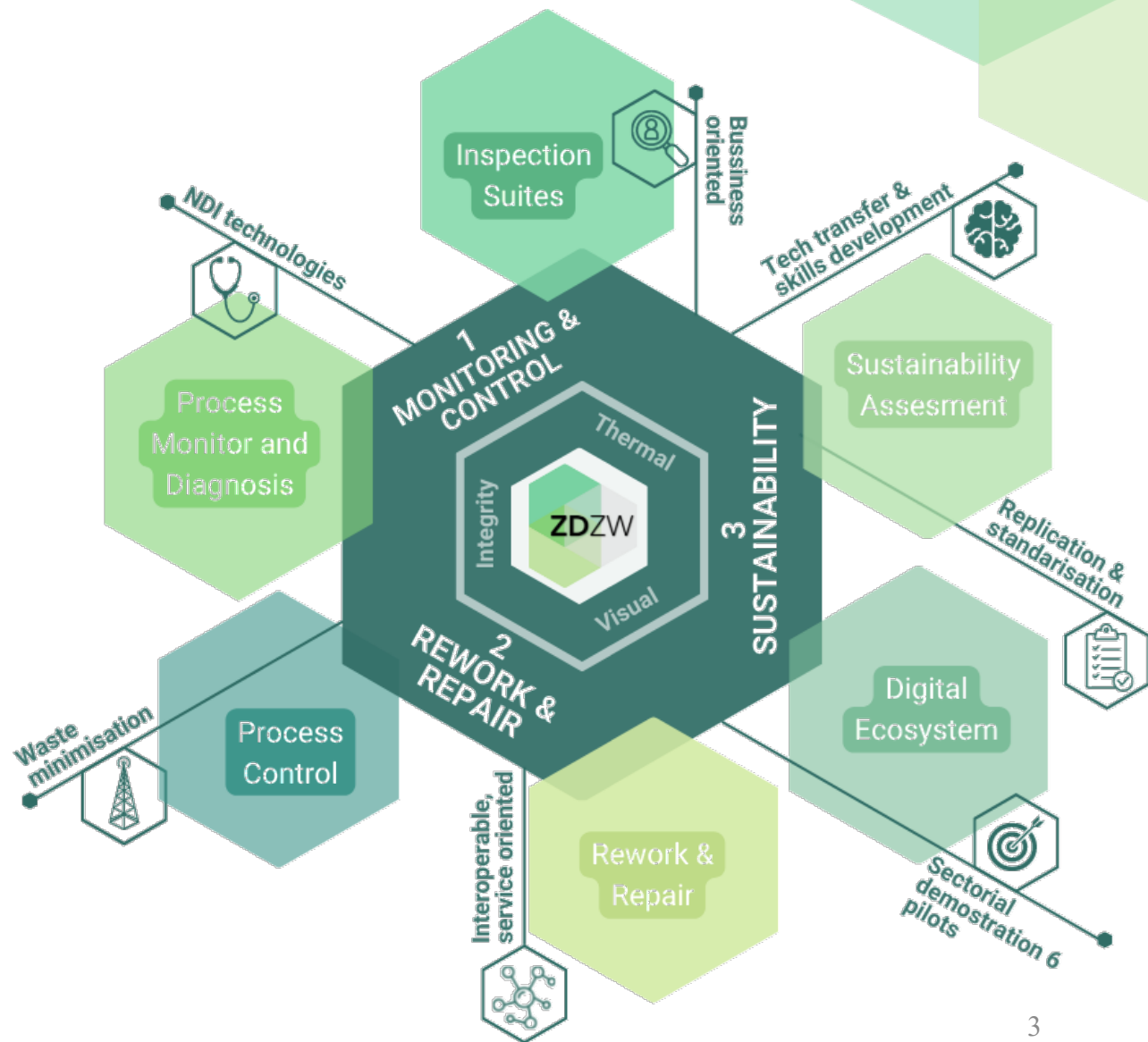
To develop digital non-destructive inspection services to improve production efficiency, zero-defect and sustainable manufacturing of European industries.

### 3 Key Areas

Monitoring and control improvement for process quality assurance.

Digitally enhanced rework & repair procedures for part recovery and scrap reduction.

Continuous sustainability evaluation to ensure the efficient use of materials and components.





# Introduction

## Pillars

### ZDZW Monitoring and Control Digital Suites (1)

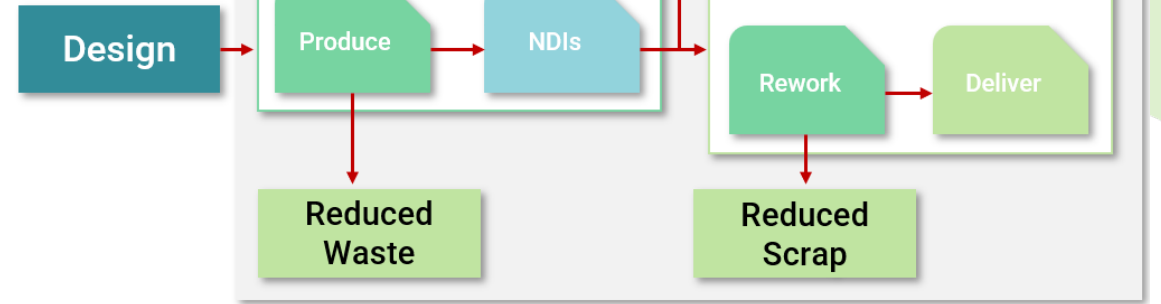
- Part Integrity, Visual Requirements and Thermal Process efficiency.
- Inspection-as-a-Service (IaaS), guaranteeing its cost effectiveness and improved return of investment offering several types of subscription and pay-per-use business models depending on the offered functionalities.

### ZDZW Process Monitoring and Diagnostics (1)

- IoT-based NDI services developed to inspect and diagnose 100% of produced components.

### ZDZW Process Control(1)

- Reduce the process generated waste and maximize the number of FTR produced parts while simultaneously reducing the need of reworks and resulting scrap.



### ZDZW Rework & Repair (2)

- Enhancing the reworking process of components, reducing the time spent by rework operators repairing fault components.

### ZDZW Digital Ecosystem (1-2)

- Collaboration with relevant initiatives providing interoperability, interlinking, security, data reliability and digital platforms.

### ZDZW Sustainability Assessment (3)

- Demonstrate its ZD and ZW approach in different industrial sectors of key importance for global sustainability.

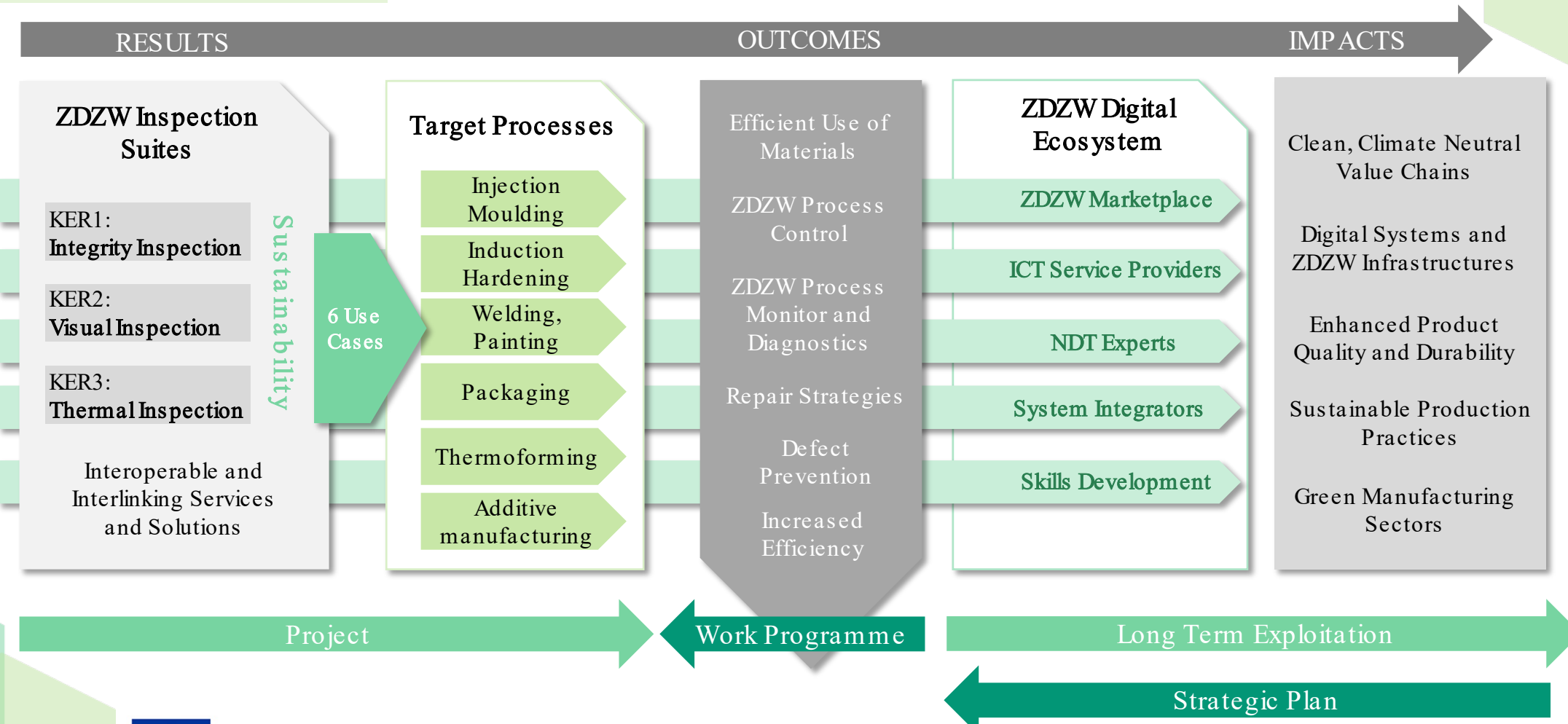




# Introduction

## Pathway to Impact

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# Zero Defect Waste

## 6 Pilots

Involving production processes  
with an important waste reduction  
potential

# Benefitting from Zero-Waste Manufacturing

## PILOT 1: Plastic parts mass production quality assurance

More efficient, cost effective and agile system for visual and dimensional inspection of thermoplastics parts by injection moulding

### Expected outcomes

- 100% produced parts inspected
- Improvement in the use of raw materials
- New quality level

### Expected Improvements

- ↓9-12% energy consumption
- ↓8-12% GHG emissions
- ↓2-3% waste and rejection rates
- ↑7-10% the productivity
- 3-5% global savings

**SOLUTION:** ZDZW Visual inspection Suite - Monitoring

# Benefitting from Zero-Waste Manufacturing

## PILOT 2: Thermoplastics forming excellence

Fully optimized thermoforming process for refrigerator inner body production based on AI-enhanced thermal imaging and processing features

### Expected outcomes

- ↑Quality of manufacturing process and ↓scrap ratio
- ↑Controllability of manufacturing process
- Successfully feedback to optimize machine parameters automatically

### Expected Improvements

- ↓8% Scrap ratio
- ↓10% Energy consumption
- ↑10% efficiency
- ↑25% data quality
- 2,3M€/year global savings

**SOLUTION:** ZDZW Thermal Inspection Suite - Control





# Benefitting from Zero-Waste Manufacturing

## PILOT 3: Wind turbine tower production enhancement

Reduce defects of welding and painting during the wind turbine tower manufacturing process

### Expected outcomes

- ↓ Repairing costs for welding processes
- ↑ Automatic defect detection and feedback for RT monitoring and welding control
- ↓ Direct involvement of operators during complex conditions
- ↑ Inspection-repair time in the painting process

### Expected Improvements

- ↓ 15% reduction of repairing costs for welding
- ↑ 25% inspection-repair time for painting
- ↑ detection and repair of 95% of all defects, prior delivery

**SOLUTION:** Integrity-Visual – Thermal Inspection – Control, Rework





# Benefitting from Zero-Waste Manufacturing

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## PILOT 4: Durable fastening solutions production

Monitor the induction hardening process in RT for bolt manufacturing used in the wind industry

### Expected outcomes

- ↓ Required destructive test
- ↑ Productivity and ↓ scrap
- ↑ Component internal mechanical properties
  - Better + more durable + lighter

### Expected Improvements

- ↓ 25% Energy consumption
- ↓ 100.000€ production cost/year
- ↓ 50% Waste
- ↑ 33% production

**SOLUTION:** ZDZW Integrity Inspection Suite - Control



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# Benefitting from Zero-Waste Manufacturing

## PILOT 5: Lithography-Based eHealth parts production

Cost-effective in-line inspection of ceramic antenna modules used for in-vivo medical applications

### Expected outcomes

- ◆ Defect identification to stop the process without wasting time
- ◆ Process optimisation via RT-adjustment of printing parameters
  - ◆ Speed + Temperature + amount of material + Pressure
- ◆ Quality statement record for each and every component

### Expected Improvements

- ◆ ↓50% rejected antenna modules
- ◆ ↓12,5% energy consumption
- ◆ ↓2,5t of ceramic/year
- ◆ ↑ 9M€/year saving

**SOLUTION:** ZDZW Integrity Inspection Suite - Control

# Benefitting from Zero-Waste Manufacturing

## PILOT 6: ILLY – Coffee capsule AV AI-Based quality control

RT-Control of the coffee capsule production process, monitoring the quality of assembled, filled and welded capsules and of formed and welded Cube Pack

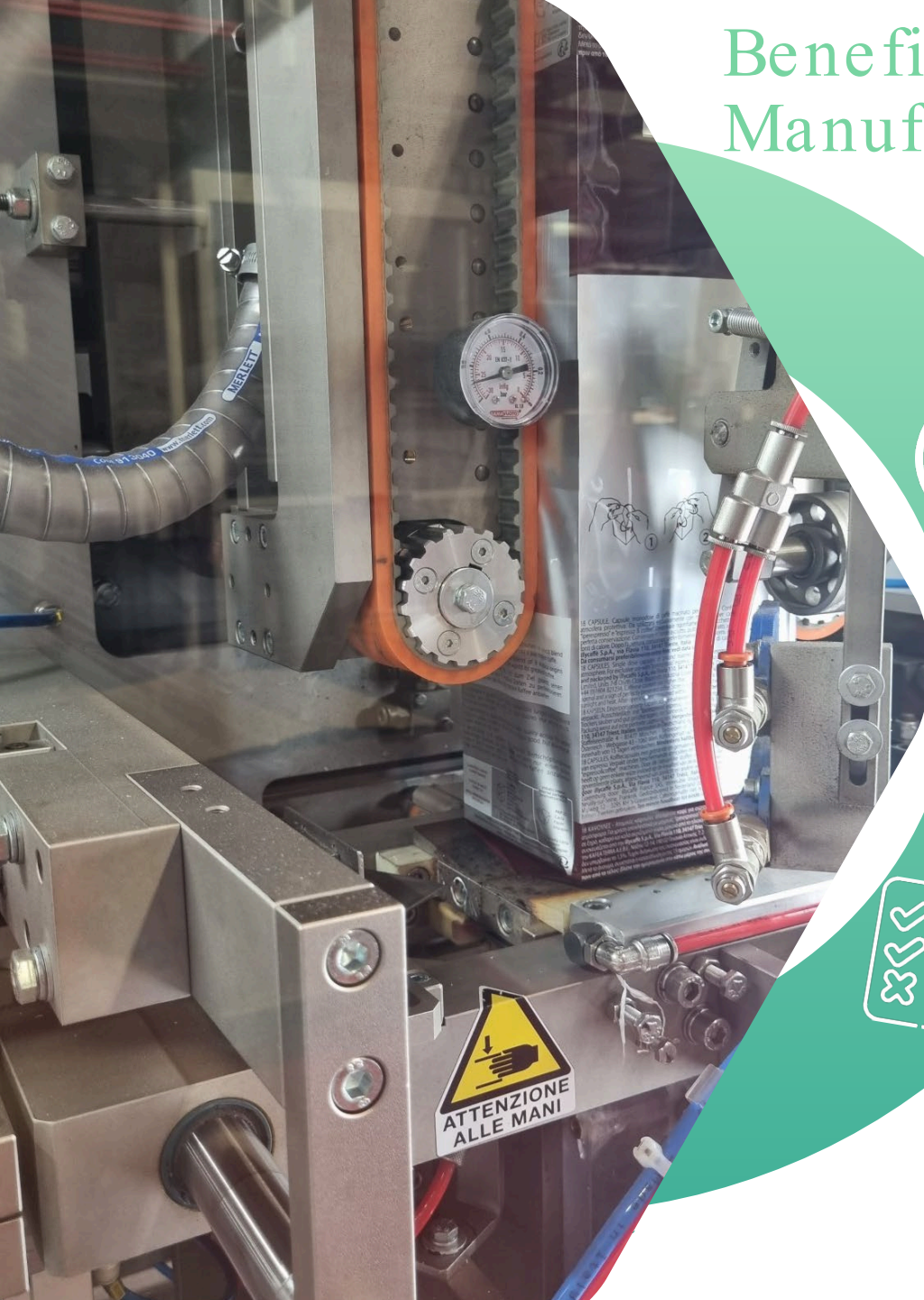
### Expected outcomes

- ↓ Actual use of current destructive sample testing
- Limiting the rejection only to the defective capsules
- ↓ Energy and material waste including the expensive one of the raw material

### Expected Improvements

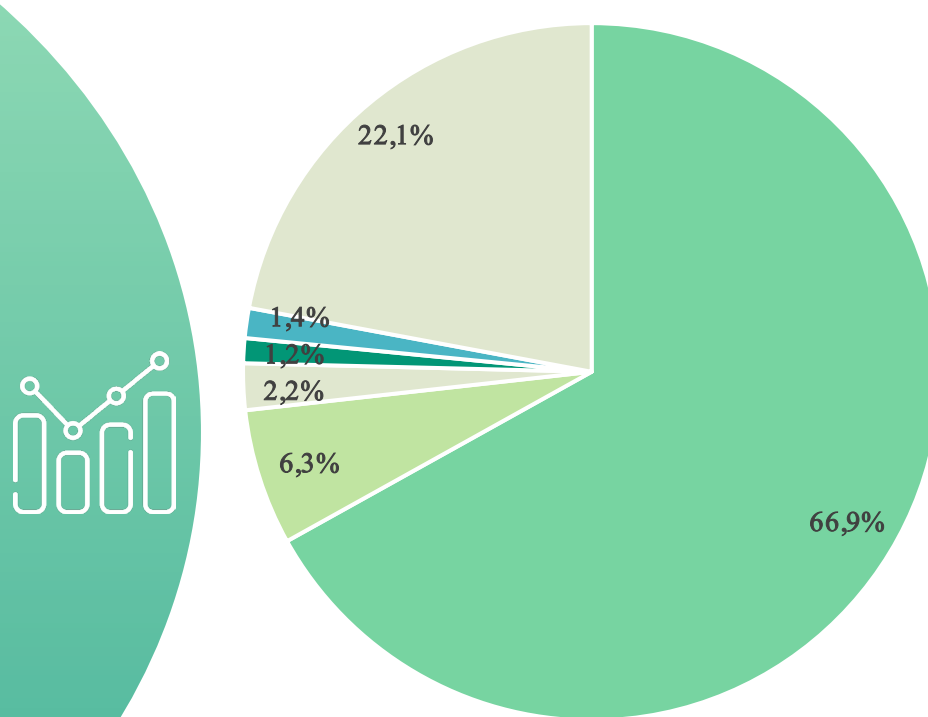
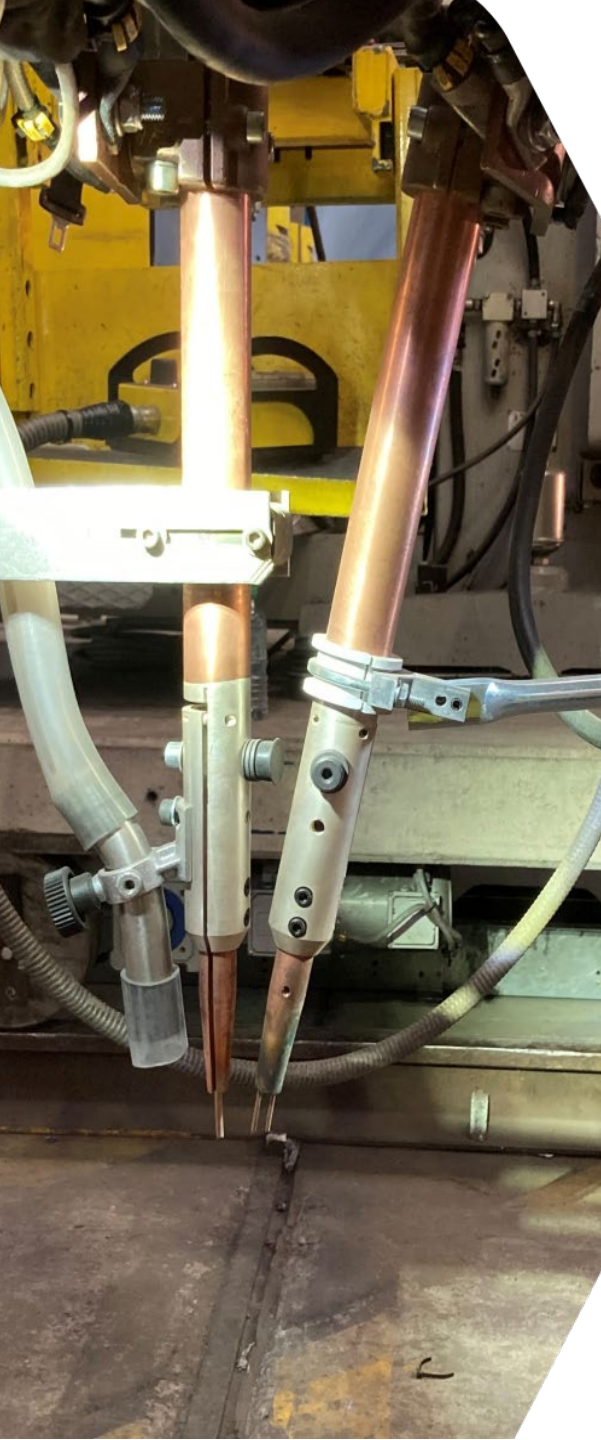
- ↓ 10t/year or generated waste
- ↓ 1% defects
- ↓ 1% energy consumption

**SOLUTION:** ZDZW Visual-Thermal Inspection Suite - Monitoring



# Return On Investment

ROI solutions: **37 months** (FTR 60%) or **18 months** (FTR 70%)



- Operators welding repairing cost (euros/year)
- Machine Welding amortization (euros/h)
- Welding flux scrap (euros/year)
- Energy consumption (euros/year)
- Welding Steel scrap quantity year (euros/year)
- Welding wire scrap quantity per year (euros/year)

	Current Cost (€)	Recovery FTR 60%(€)	Recovery FTR 70%(€)
FTR	0,5	N/A	N/A
Operators welding repairing cost (€/year)	435000	43500	87000
Machine Welding amortization (€/h)	41040	4104	8208
Welding Steelscrap quantity year (€/year)	14000	1400	2800
Welding wire scrap quantity per year (€/year)	7504	750	1501
Welding flux scrap (€/year)	9040	904	1808
Energy consumption (€/year)	143412	14341	28682
<b>Total (€/year)</b>	N/A	<b>64249</b>	<b>129999</b>
<b>ROI(month)</b>	N/A	<b>37</b>	<b>18</b>

IaaS can make the approach even more affordable!



# Our Open Beta Testing Pilot

Falling behind with the new market updates regarding zero-waste production technologies?

ZDZW will offer you the possibility to test **free of charge** one of their **11 Non-Destructive Inspections Solutions** with digitally-enabled manufacturing processes



Increase your productivity by 7%



Halve the waste and decrease energy consumption by 25%



Work hand by hand with best-in-class tech solution providers



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# Thank you!

## Contact us



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