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Non-destructive Inspection Services For Digitally Enhanced Zero Waste Manufacturing

Innovative Approaches to Sustainable Manufacturing: Harnessing Non-Destructive Inspection Solutions

07.05.2024 – Manufacturing Partnerships Days

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Funded by the European Union

The ZDZW project has received funding from the European Union's Horizon Europe programme under grant agreement No 101057404. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

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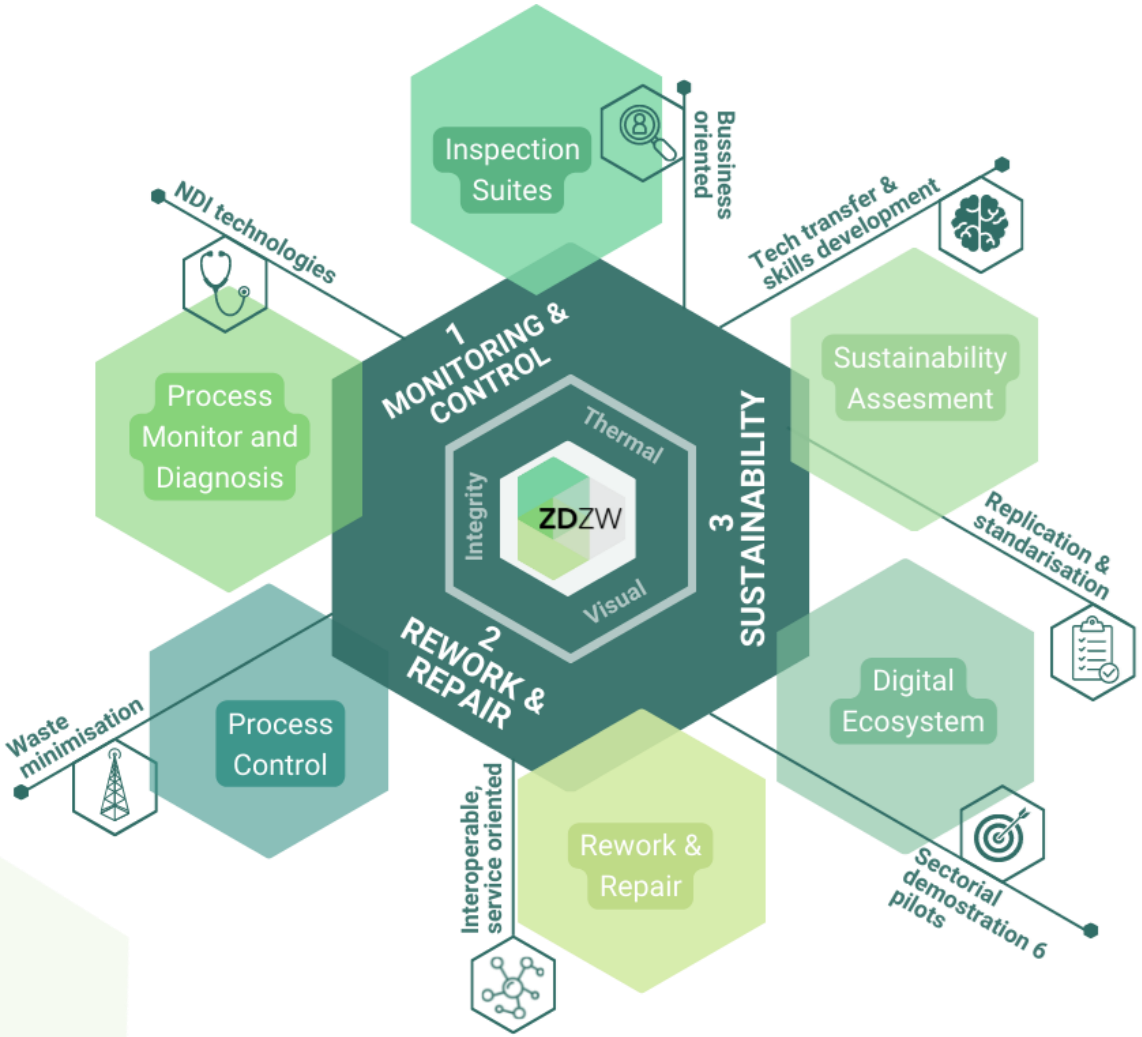
GENERAL ZDZW OVERVIEW

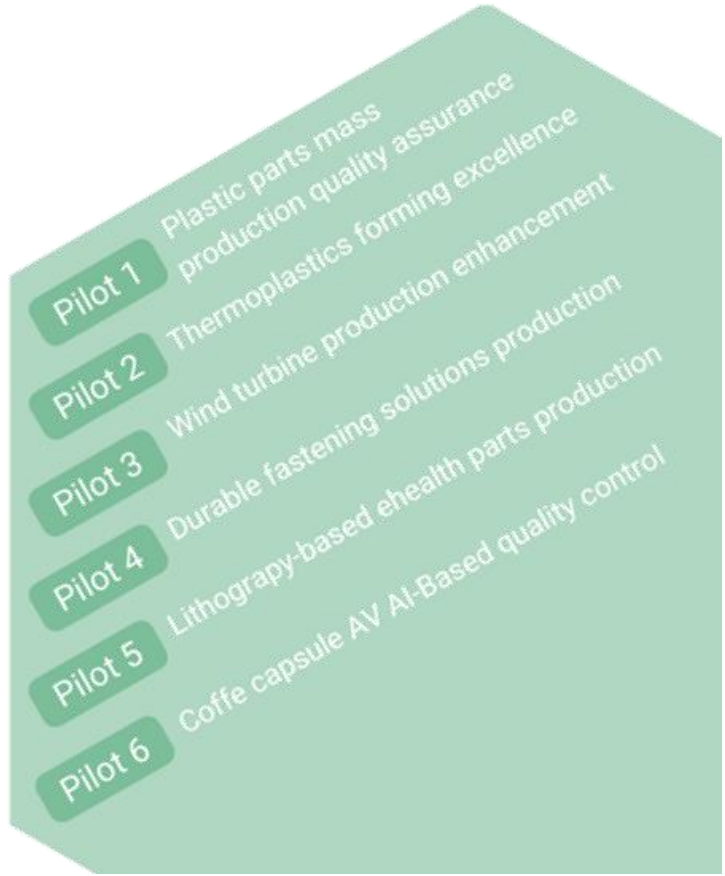
11M€ from the EU budget

3 years
Sep. 2022 – Aug. 2025

27 partners from 10 different countries

The aim is to develop **digital non-destructive inspection services** as a set of strategic technologies to **improve production efficiency, zero-defect** and **sustainable manufacturing** of European industries.





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1. Introduction to ZDZW

HORIZON-CL4-2021-TWIN-TRANSITION-01
(TWIN GREEN AND DIGITAL TRANSITION 2021)

ZDZW consortium: 27 partners including 12 industrial SMEs

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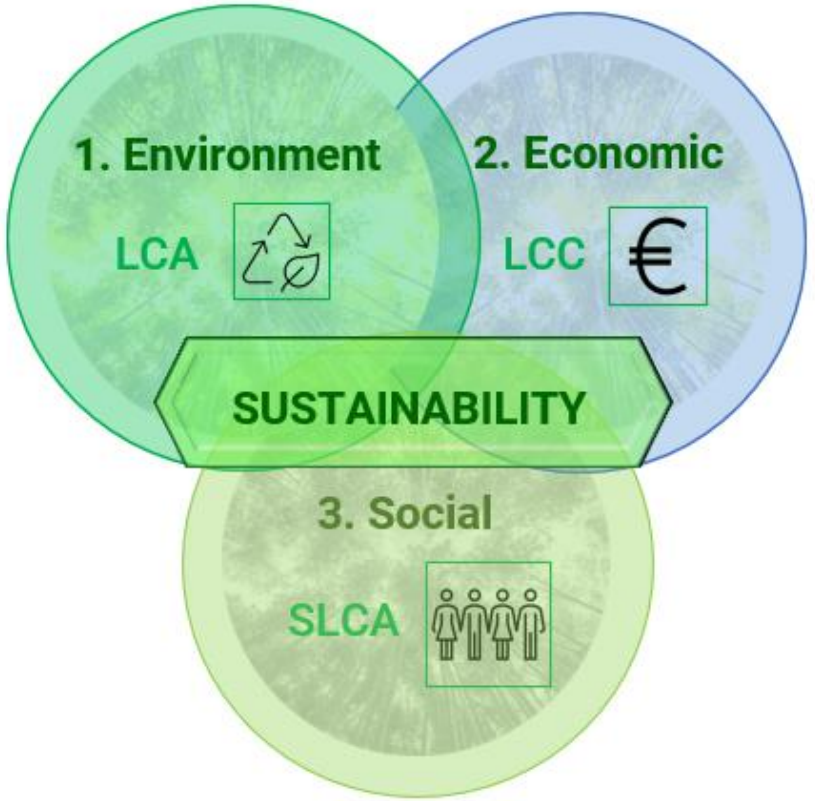
2. Sustainability within ZDZW

Profitable business model that prioritizes environmental and social responsibility



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3. Life cycle assessment - LCA

Based on DIN EN ISO14040:2006

DIN EN ISO 14044:2006

LCA quantifies the ecological footprint of products/processes across their entire life cycle.

- ✓ Identify hotspots
- ✓ Optimize value chain
- ✓ Improve decision-making

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3. Life cycle assessment – LCA
Industrial Use Case: Thermoforming Process

- Implementation of ZDZW solutions to **automate quality assessment** of inner body parts produced through thermoforming.
- Focus on ensuring high-quality production of **refrigerator inner body** with dimensional precision and defect-free surfaces.
- Challenges in **thermoforming process** due to variability in process parameters leading to defects.

Visual Inspection Suite

Thermal Inspection Suite

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3. Life cycle assessment – LCA
Key Performance Indicators (KPIs) for Sustainable Manufacturing

- Defining KPIs to evaluate the impact of ZDZW Inspection Solutions on sustainable manufacturing:
  - Raw material (HIPS)
  - Scrap
  - Energy
  - CO_2 saving
- Importance of **monitoring the KPIs** (scrap rates, material consumption, and environmental sustainability) post-implementation of **Visual/Thermal Inspection Solutions**.
- Calculating carbon dioxide emissions as an environmental sustainability KPI using **life cycle assessment** approach.

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3. Life cycle assessment – LCA Environmental Sustainability KPI

- **Carbon dioxide emissions** to analyze the impact of ZDZW non-destructive inspection solutions.
- Calculation of emissions based on the **life cycle assessment** approach and comparison between baseline and post-implementation scenarios.
- Carbon dioxide emissions includes the emissions from the raw material (**HIPS**) and **electricity** consumption:
  - Functional unit – per unit produced
  - Impact assessment methodology – ReCiPe 2016
  - Database – Ecoinvent

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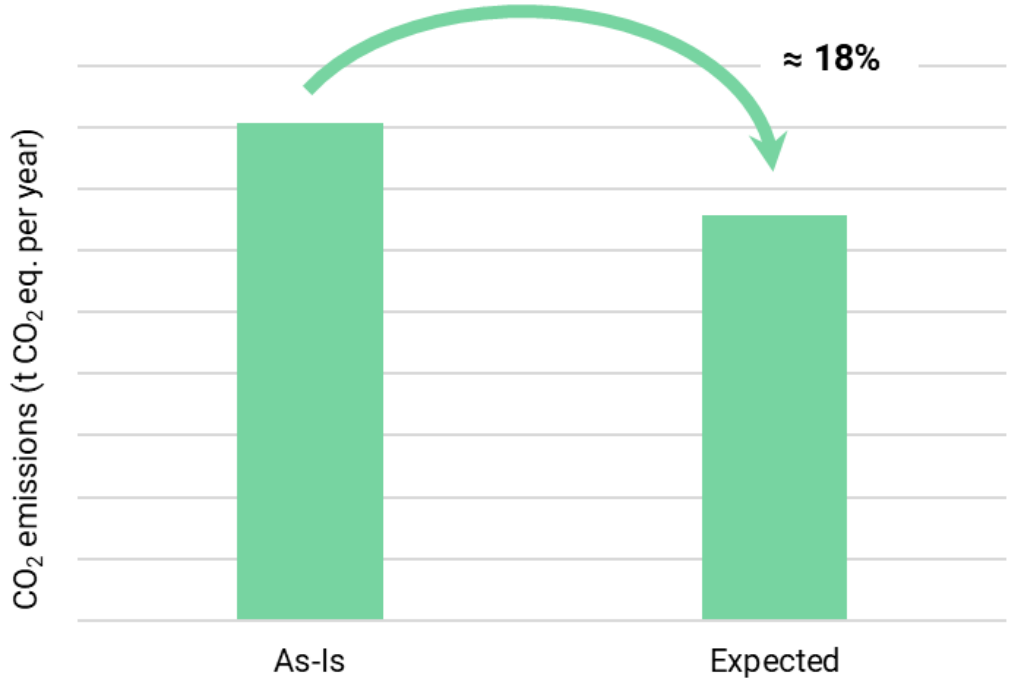
3. Life cycle assessment – LCA
Carbon dioxide emissions

- Carbon dioxide emissions – **37.07 kg CO2 eq./unit produced**
- Unit = Refrigerator inner body
- **Aiming to reduce ≈1500 t CO2 eq. per year**



$$CO_2 \text{ eq.} = EF_{HIPS} \times \text{Amount of HIPS} + EF_{Electricity} \times \text{Electricity consumption}$$

EF – Emission Factor

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4. Environmental life cycle costing - eLCC

System boundaries and functional units equivalent to those of LCA

LCC = IC + OC + MC + DC + EC

IC: Initial investment
OC: Operational cost
MC: Maintenance cost
DC: Disposal cost
EC: External environmental cost.

LCC: comprehensive overview of the costs across the entire life cycle of a product/process

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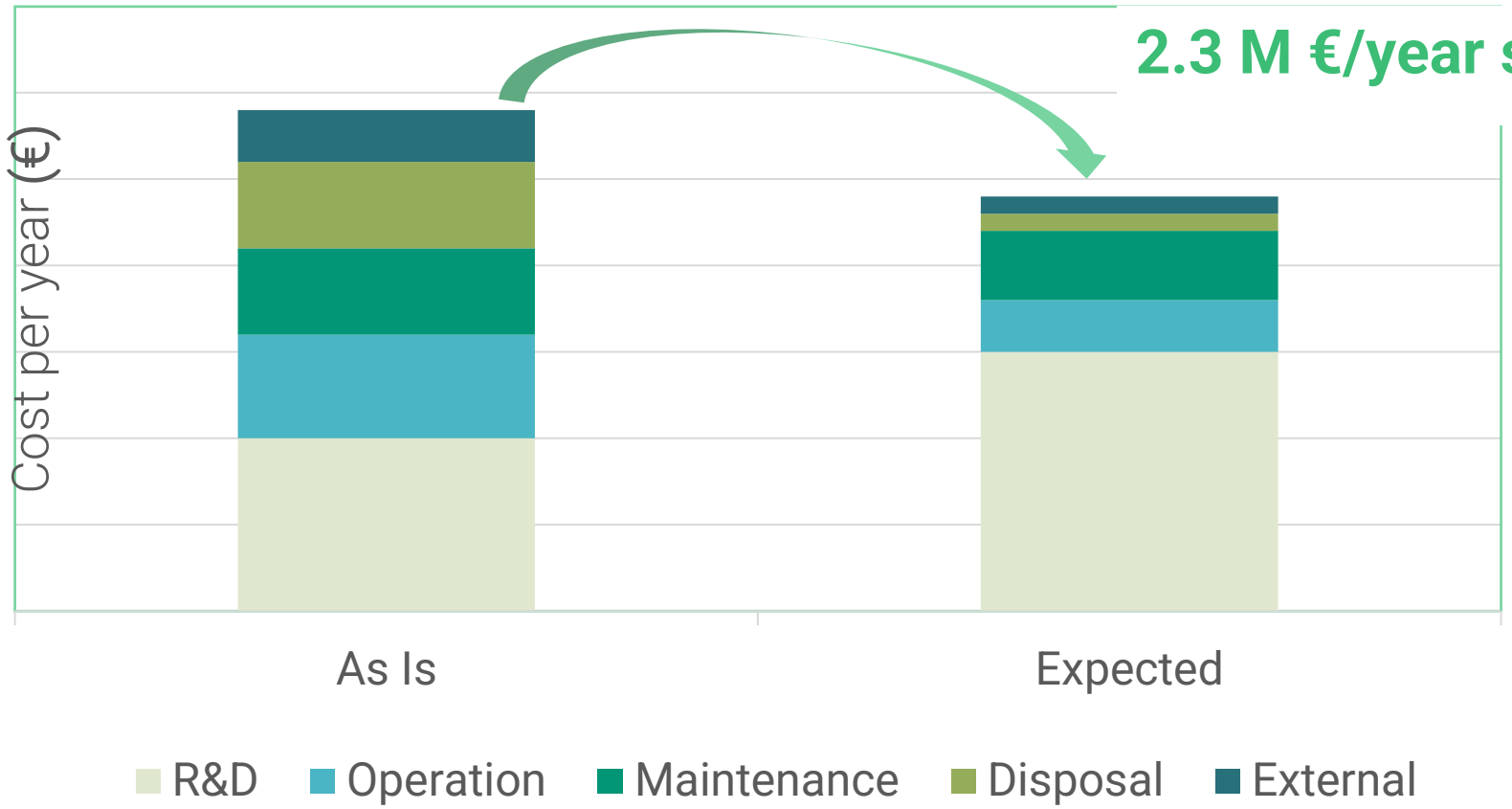
4. Environmental life cycle costing

eLCC - Thermoforming



Despite higher upfront costs due to the new technology, eLCC reveals the long-term economic benefits

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5. Social analysis: Objective(s)

Listen to the employees to identify obstacles and facilitate change.

This way, we will:

Ensuring workers' well-being by reducing the negative impact of the change and involving them in the process.

Implement the change with a more complete vision of the value chain process and avoid resistances.

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5. Social analysis: Procedure

For a company change, there are three main phases:

Social analysis Previous to the change (or in the early steps)	Mitigation and remediation	Social analysis

• Workshops
• Surveys
• Focus groups
	• Create a tailor-made strategy:
	  • Training
	  • Coaching
	  • Applying specific changes to the implementation
		• Workshops
		• Surveys
		• Focus groups

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5. Social analysis

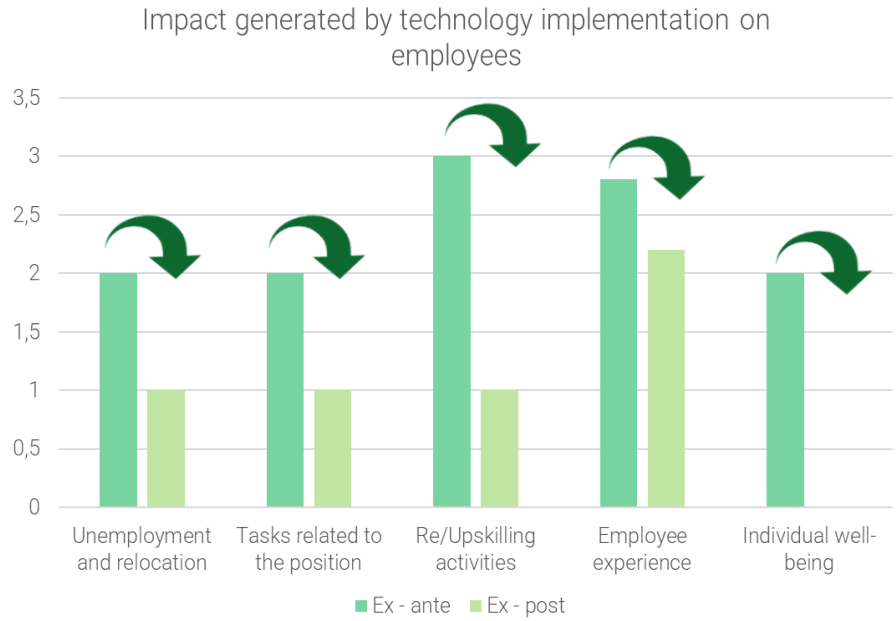
Objective

- Try to reduce the negative impact technology implementation could have on employees.

Indicators' general framework

Categories	Example indicators
Unemployment and relocation	Perception regarding the possibility to be relocated
Task related to the position	Typology of tasks that are susceptible to change
Re/upskilling	Perception regarding the need for re/upskilling
Employee experience	Perception regarding the usability of the technology
Individual well-being	Situation of the general health due to the implementation of the technology

24-31 indicators (depending on the pilot) + 8 technology acceptance questions



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5. Social analysis: How has it been applied – Our Specific Procedure

1. Ex-ante social impact assessment

- **Pilot workers**
  Presentation meeting
- **Pilot workers**
  1st **meeting /survey**
  ex-ante assessment
- Results for the ex-ante assessment

2. Mitigation remediation plan

- **Pilot leaders**
  2nd **meeting**
  Results presentation and co-creation session
- Dissemination of the Mitigation Plan
- Implementation of the Mitigation Plan

3. Ex-post social impact assessment

- **Pilot workers**
  3rd **meeting/survey**
  ex-post assessment
- Results for the ex-post assessment
- **Pilot workers**
  Results presentation meeting

4. Measure satisfaction of workers

- Technology acceptance/satisfaction questionnaire
- Technology acceptance/satisfaction questionnaire

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6. Conclusions

- LCA and LCC provide long-term perspectives, emphasizing the importance of considering the entire life cycle of products, processes, or systems. This long-term view is essential for sustainable and responsible decision-making.

- Social Analysis allows to understand which are the **resistances and stoppers to implement changes** on a company. Knowing about these obstacles allows them to be **mitigated and to have a successful implementation and a satisfied and committed team**.

- The combination of strategic methodologies such as eLCC and Social Analysis with LCA enable decision makers to **manage complexity, optimize resource allocation and foster a business environment** that integrates **economic profitability with social and environmental responsibility**.

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BETA TESTING PILOT

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ABOUT THE BETA TESTING PILOT

Great Opportunity for Companies that are looking to Transform their Manufacturing process reducing waste and boosting productivity.

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7%

Increase in productivity

25%

Decrease in energy consumption

50%

Reduction in material waste

RECEIVE

FREE

FREE TESTING

For a select number of testers

PERSONALISED OFFER

From leading European Technology providers

Download the catalogue with all the information

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WHY TO APPLY

BENEFITS:

✅ **Increased Productivity:** Streamline your processes for maximum efficiency.

✅ **Reduced Energy Consumption**: Contribute to sustainability goals and save on energy costs.

✅ **Minimized Material Waste:** Optimize resource utilization and minimize environmental impact.

11 SOLUTIONS THAT COVER:

🔦 **Integrity Inspection:** Ensure the highest quality standards.

👀 **Visual Inspection:** Precision through advanced visual technology.

🌡️ **Thermal Inspection:** Detect and address thermal issues proactively.

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APPLY NOW!!

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We have extended the time to apply until May 30th.

Learn more and apply here!

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Thank you!

Contact us

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