



RESEARCH & INSIGHTS PACK

Industrial research. Factory-floor perspective.

Ergonomics | Human-centered manufacturing | Innovation at scale

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Exoskeletons in real production environments

2022

Exoskeletons for workers: A case series study in an enclosures production line

Applied Ergonomics | DOI 10.1016/j.apergo.2022.103679

A case-series view of passive shoulder exoskeleton use in an industrial production line, connecting ergonomics with real work conditions and operator experience.

2025

Introducing a Passive Shoulder Exoskeleton in a Production Plant: A Longitudinal Observation of Its Effects on Workers

IEEE Transactions on Human-Machine Systems | DOI 10.1109/THMS.2025.3536199

A longitudinal observation focused on sustained industrial use, worker experience and the practical effects of introducing a passive shoulder exoskeleton into production.

The Factory of the Future Must Be Human First

The most advanced factory is not necessarily the one with the fewest people.

- **Human-centered is an engineering principle**

Technology should increase capability, safety, learning and decision quality rather than simply remove headcount.

- **Automation and people are not opposites**

The strongest systems combine the repeatability of automation with human context, adaptability and judgment.

- **Measure what changes for the operator**

A solution that looks efficient in a dashboard can still create hidden cognitive load, workarounds or loss of trust.

Why Manufacturing Pilots Die Before Global Rollout

A successful pilot proves that something can work. It does not prove that an organization can repeat it.

- **The pilot optimizes for proof**

The rollout must optimize for repeatability, ownership, support and predictable economics.

- **Standardization needs boundaries**

Global architecture and governance should be clear, while local execution keeps enough flexibility for real factory differences.

- **Lifecycle is part of the product**

Training, maintenance, data, cybersecurity, support and obsolescence must be designed before scale, not after.