PRODUCTION FORECASTING IN PACKAGING
OUR STORY

1970
First prototype for the family dairy

1985
March 1st - Galdi was founded

1993
First time outside Italy

2010
Lean Manufacturing

2011
Russia Strategic Business Unit

2013
Morocco Strategic Business Unit

2015
USA Strategic Business Unit

2018
Algeria Strategic Business Unit
WHO WE ARE

105 EMPLOYEES

89 ITALY
16 ABROAD

QUALIFICATION

71,0% Engineering
12,0% Financial
15,0% Linguistic/Humanities
2,0% Others

HOURS OF TRAINING

2413
966
1167
280

Improvement of technical, production, design and software skills.
Communication and teamwork skills.
Rolling improvement, safety standards, certifications, corporate and innovation strategies.
<table>
<thead>
<tr>
<th><strong>AFTER SALE</strong></th>
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<tbody>
<tr>
<td><strong>ENGINEERS ON THE FIELD</strong></td>
<td><strong>11</strong></td>
</tr>
<tr>
<td>Our pro-active professionals support you in the training phase and in all technical aspects.</td>
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<td>Benefit of their know-how to make the most of your packaging system!</td>
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<tr>
<td><strong>TAILOR MADE MAINTENANCE SOLUTIONS</strong></td>
<td><strong>7</strong></td>
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<td>Dedicated maintenance solutions suitable for all kinds of production scenarios.</td>
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<td>Ask our After-Sales Dept. for more details.</td>
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<td><strong>ON DEMAND</strong></td>
<td><strong>CHECK-UP</strong></td>
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<td>Evaluation of the actual status of your Galdi filler with dedicated study of the revamping project. Experienced technical support into the evaluation of refurbishment of second-hand machines.</td>
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<tr>
<td><strong>KEEPING UP WITH THE TIMES</strong></td>
<td><strong>UPGRADE</strong></td>
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<tr>
<td>Extend your machine life-cycle by taking advantage of Galdi’s innovative maintenance programmes; take care of the environment by reducing the use of energy and water, or improve your TCO by simply implementing dedicated technical solutions. <em>Just ask Galdi!</em></td>
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RG SERIES

CAPACITY
2,000 – 7,000 pc/h

TECHNOLOGY
Clean / Ultra Clean / Hot Fill

FILLING SYSTEM
Flow Meter / Double Diaphragm Filler / HV Piston

MANY OPTIONS AND CUSTOMIZATIONS AVAILABLE
RG SOLUTIONS

LIQUID OR DRY? CHILLED OR AMBIENT DISTRIBUTION? FRESH OR EXTENDED SHELF LIFE?

ESL PRODUCTS  VISCOUS  LIQUID EGG  HF JUICE  DRY FOOD
**USE CASE: PERFORMANCE FORECAST**

**MES SYSTEMS? NO THANKS, THEY ARE ALWAYS IN LATE. WE NEED TO SEE IN THE NEAR FEATURE, NOW!**

<table>
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<tr>
<th>GOAL</th>
<th>PERFORMANCE METRICS</th>
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| Forecast production performance for an automatic filling machine designed for inline forming, filling and sealing of gable top cartons. | • Machine Mechanical Efficiency (MME)  
• Overall Equipment Effectiveness (OEE) |

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<th>PERFORMANCE ESTIMATION FOR</th>
<th>PRODUCTION PERFORMANCE IS PIVOTAL DUE TO</th>
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| • Predictive Maintenance/Service optimization actions  
• Optimizing production related decisions (i.e., the production scheduling) | • Strict hygiene requirements (down time caused by packaging machines can lead to product waste)  
• The time to fix the equipment before products have to be discarded is very limited |
HOW WE DO IT

GALDI IIoT ARCHITECTURE

EUROTECH

influxdata

amazon web services

https://mash.galdi.it
HOW IT WORKS

MACHINE INTELLIGENCE VIA MACHINE LEARNING

Problem
- Definition
- Expected Impact
- Evaluation Metric

Cleaning
- Quality
- Reconciliation
- Missing Data Handling
- Denoising
- Outlier detection

Collection
- Conversion
- Parsing
- Aggregation
- Alignment

Modeling
- Feature Extraction
- Building
- Evaluation

Roll-out
- Online Implementation
- Business Outcome
- Improvement

Cleaning • Conversion • Building
LEARNING FROM DATA

DEEP LEARNING ON PRODUCTION DATA

Problem formulation: sequence forecasting based on multiple inputs.

Based on Deep Learning to avoid hand-engineered feature extraction.

Alarm Counts

Machine Time Intervals

Past values of Performance Index

Forecast of Performance Index
CURRENT ACTIVITIES

• Accepted paper of preliminary results in:
  L. Brunelli, C. Masiero, D. Tosato, A. Beghi, G.A. Susto
  *Deep Learning-based Production Forecasting in Manufacturing: a Packaging Equipment Case Study*
  **29th International Conference on Flexible Automation and Intelligent Manufacturing**
  24th - 28th June 2019 @ Limerick (Ireland)

• Upgrade machine sensors

• Open dataset on Mendeley Data
be the change you wish to see in the world

Mahatma Gandhi