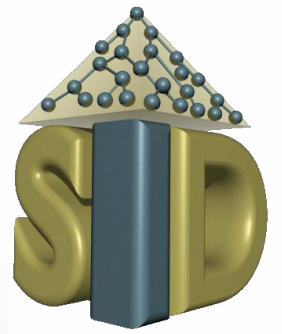


HEAT-SEER

Real-Time Data Integration Using IoT and Semantic Technologies: A Case Study in the Graphic Arts Industry



**Universidad
Zaragoza**

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¹ HENNEO Media, ² HENNEO Print, ³ SID group (Univ. Zaragoza & I3A)

XXIX Jornadas de Ingeniería del Software y Bases de Datos (JISBD 2025)
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- **HENNEO Print:** HENNEO division dedicated to the development, printing and handling of different printing solutions:
 - Newspapers (Heraldo de Aragón), daily, weekly, fortnightly and monthly publications, magazines, catalogues, leaflets, etc.
 - Until 2020, only coldset jobs (newspaper quality), no machinery for **heatset jobs** (better quality)

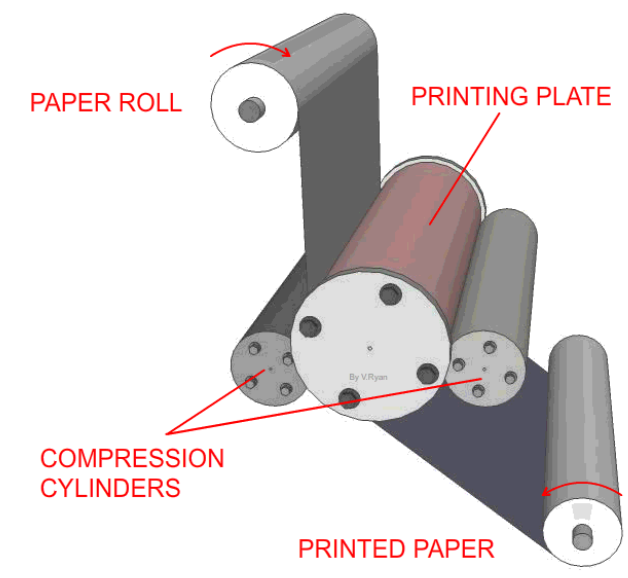
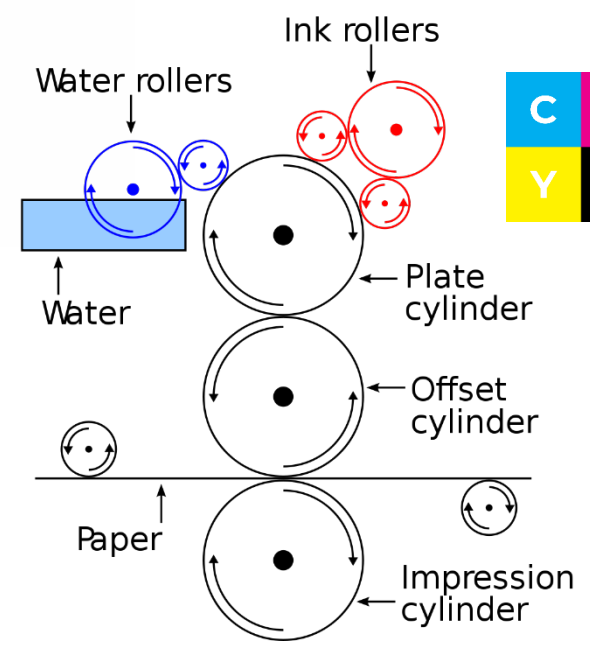
Main objective: to develop **Heat-Seer**, an **integrated management platform in real time for Heatset-type presses** in Henneo Print

1. where coldset & heatset manufacturing processes coexist with heterogeneous legacy systems
2. using IoT, BigData, & semantic technologies to capture and manage information in real-time





Printing Unit



Heatset

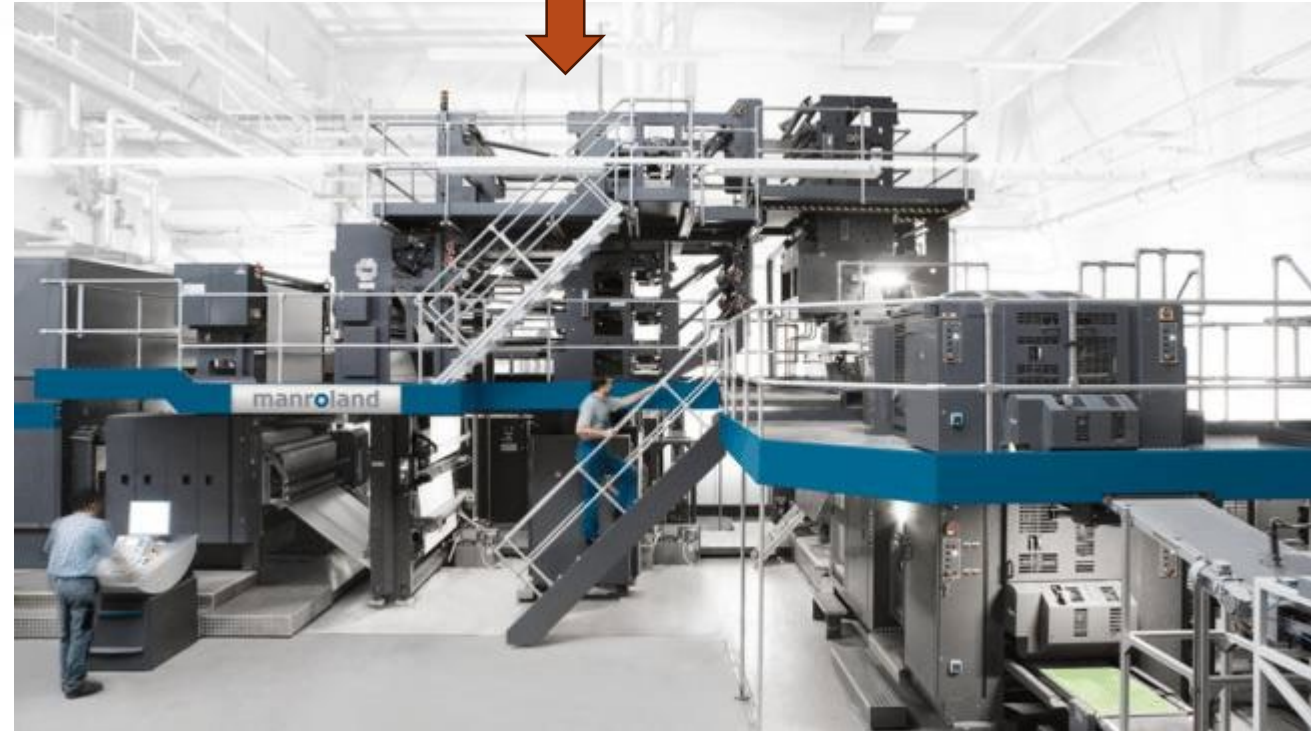


Printing Dryer



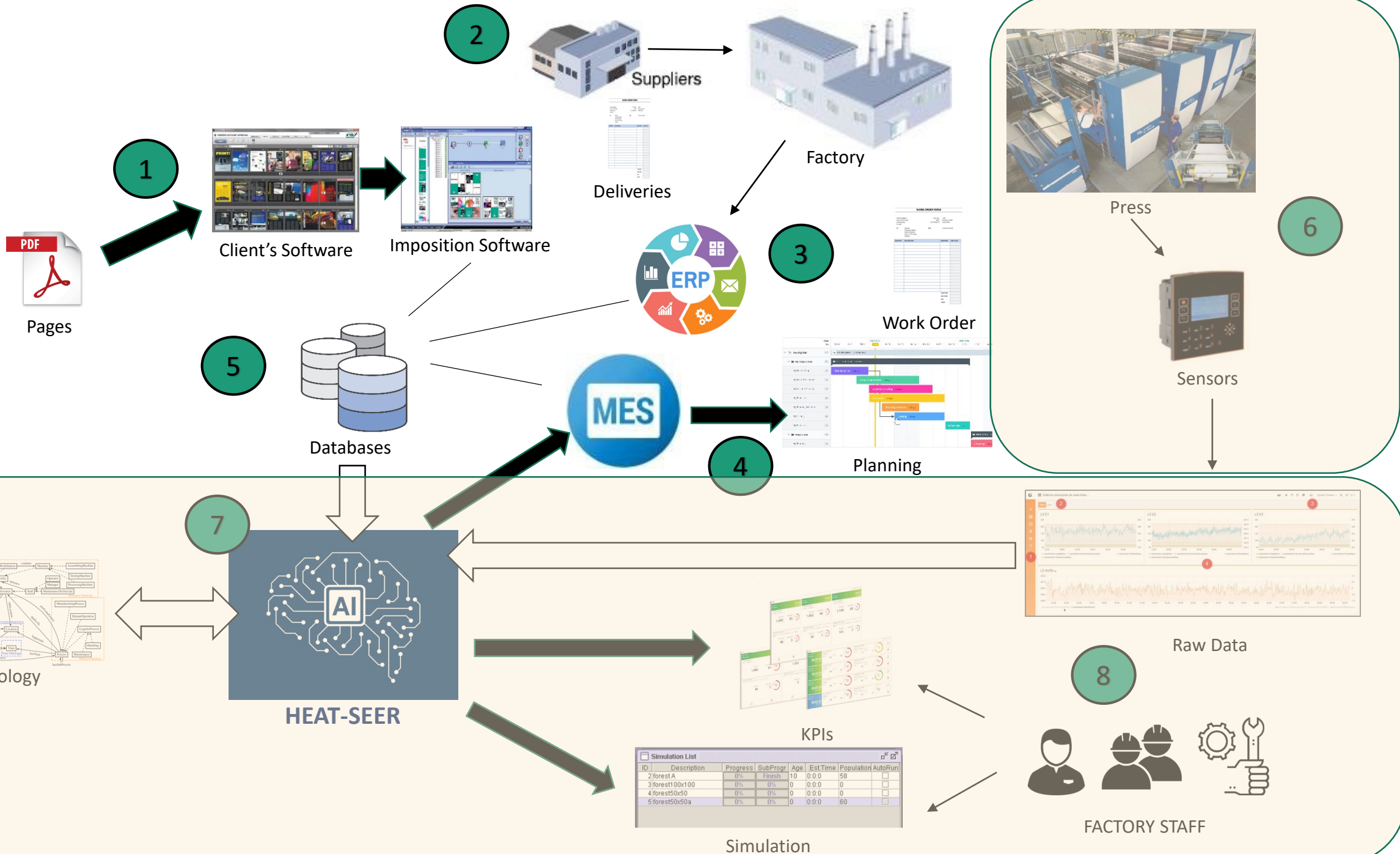
Heatset

Big Folder





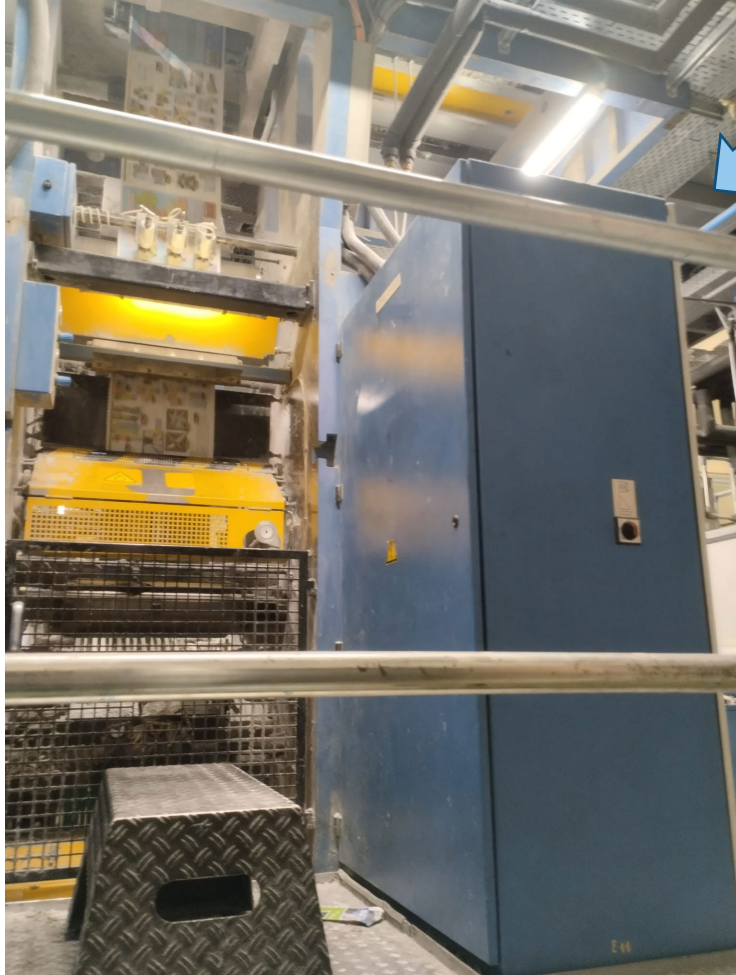




Sensorization: The Zeo System



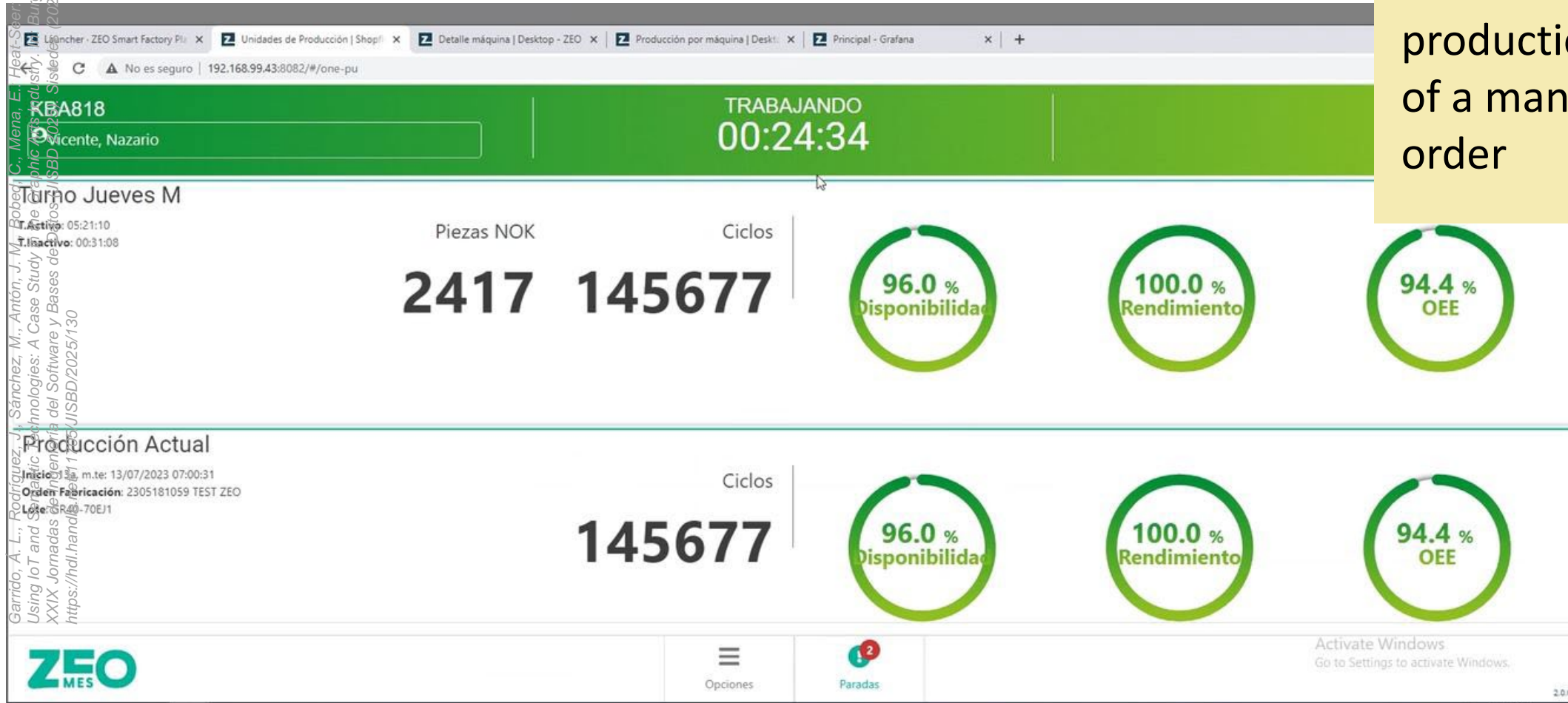
Sensorization



Sensorization



Data seen by the production operator of a manufacturing order



Garrido, A. L., Rodríguez, J., Sánchez, M., Antón, J. M., Bobed, C., Mena, E., Heat, S. et al. Real-Time Data Integration Using IoT and Cloud Technologies: A Case Study in the Electric Industry. In: Burguño, L. (ed.) Actas de las XXIX Jornadas de Ingeniería del Software y Bases de Datos (ISBD 2023). Siledeco (2023).
 https://hdl.handle.net/11171/51135/UISBD/2023/51130

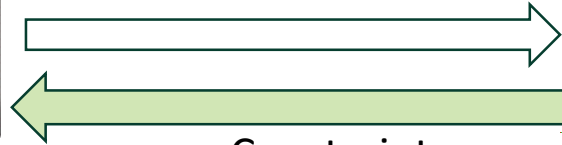
Garrido, A. L., Rodríguez, J., Sánchez, M., Antón, J. M., Bobed, C., Mena, E.: Heat-Seer: Real-Time Data Integration Using IoT and Semantic Technologies: A Case Study in the Graphic Arts Industry. In: *ICUN 2025*. Actas de las XXIX Jornadas de Ingeniería del Software y Bases de Datos (JISBD 2025). Sistemas (2025). <https://hdl.handle.net/11705/JISBD/2025/130>

1 Simulation Inputs

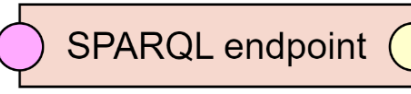


Parameters

2



Knowledge Base



Data Lake



Simulation

Warnings

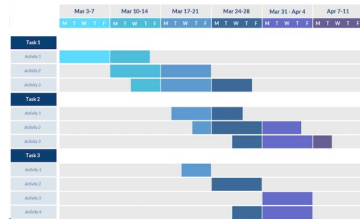
4

Revised Parameters

3



Simulation Engine



Simulation



Verifier

Discard



Ok

5

ERP



Microsoft SQL Server

MES



Microsoft SQL Server

ZEO



PostgreSQL

IoT Data



influxdb


```
set Trabajo;
```

```
param FechaMinComienzo{Trabajo};
```

```
param DuracionTrabajo{Trabajo};
```

```
param FechaMaxRecogida{Trabajo};
```

```
param FechaInicioSimulacion >= 0;
```

```
param maquina{Trabajo} symbolic;
```

```
var FechaComienzo{Trabajo} >= 0;
```

```
var FechaFinal{Trabajo} >= 0;
```

Minimizar el tiempo en que el último trabajo finaliza

```
minimize Tiempo_maximo_de_finalizacion:
```

```
sum {i in Trabajo} FechaComienzo[i];
```

```
subject to Comienzo_posterior_a_fecha_minima {i in Trabajo}:
```

```
FechaComienzo[i] >= max(FechaMinComienzo[i], FechaInicioSimulacion);
```

```
subject to FechaFinal_calculo {i in Trabajo}:
```

```
FechaFinal[i] = FechaComienzo[i] + DuracionTrabajo[i];
```

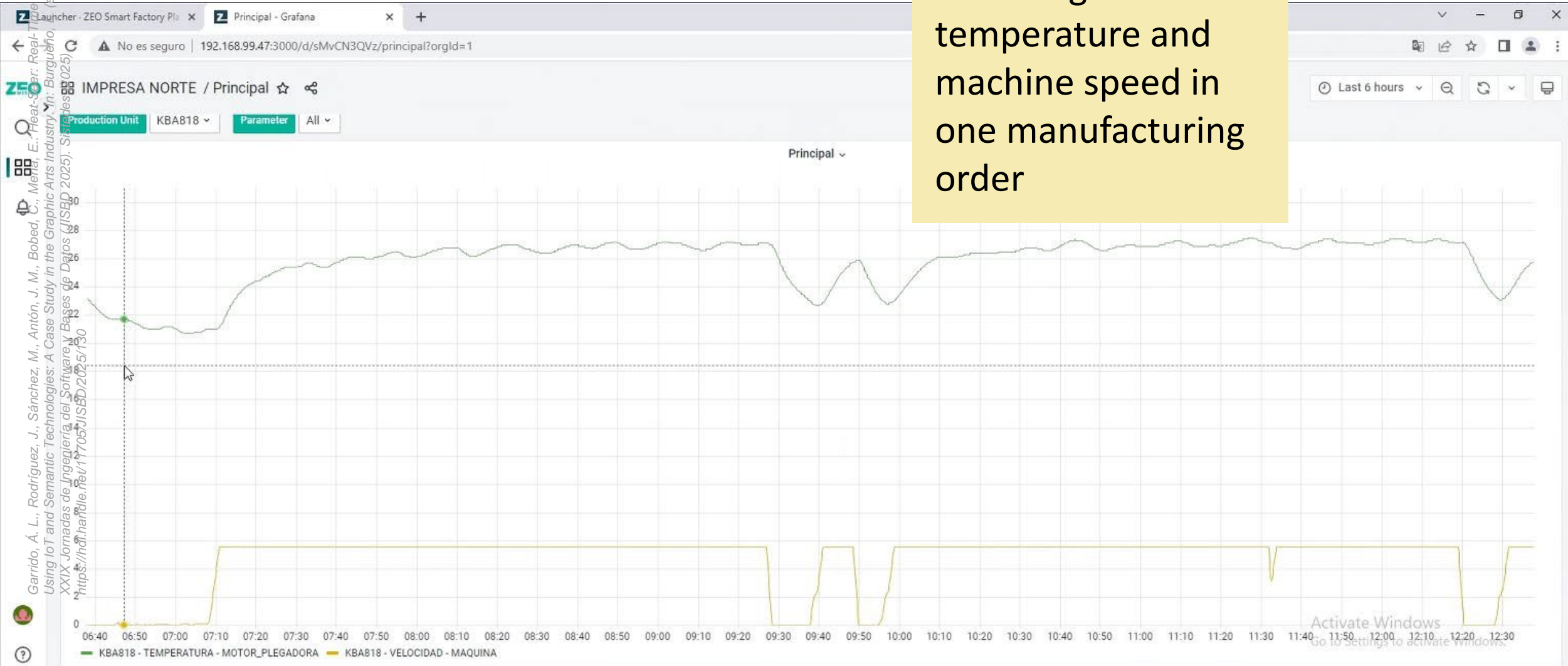
```
subject to Deben_acabar_antes_de_recogida {i in Trabajo}:
```

```
FechaFinal[i] <= FechaMaxRecogida[i];
```

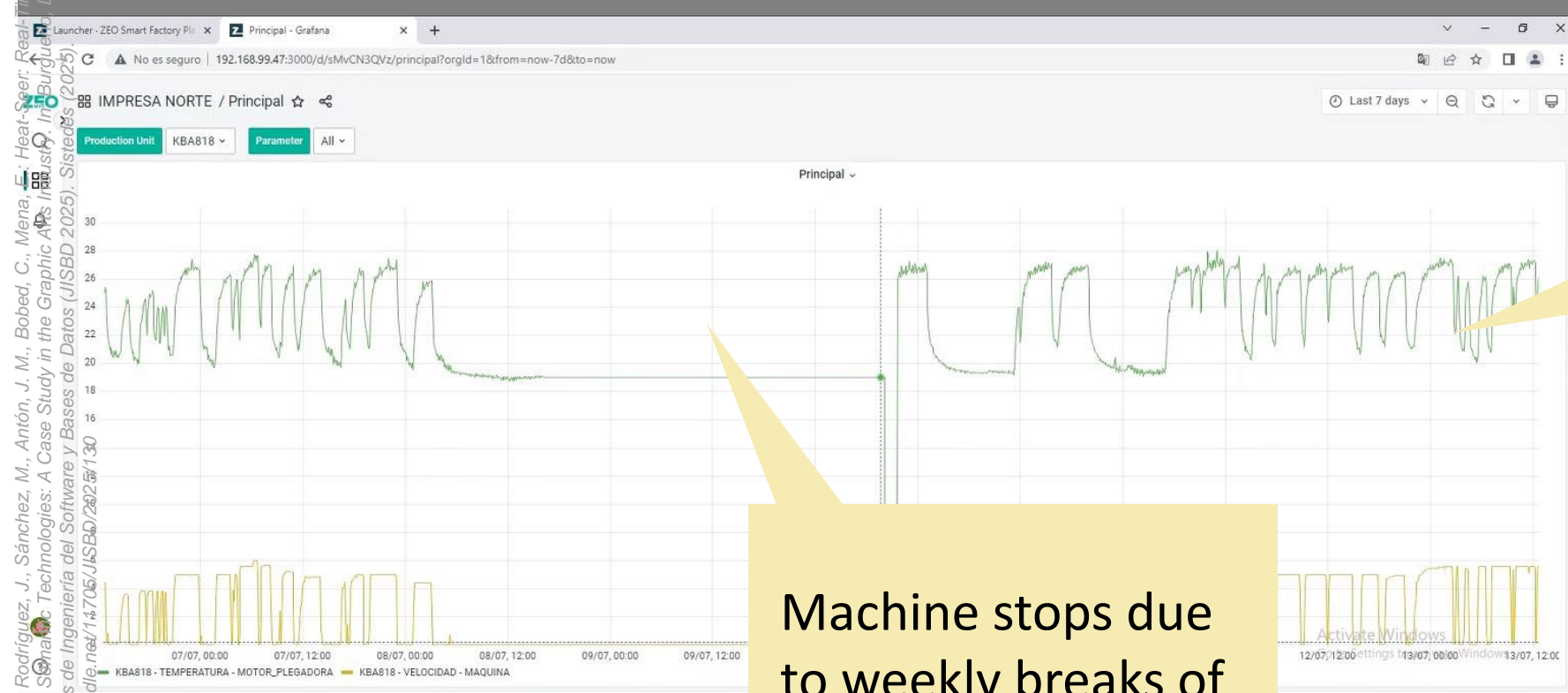
```
subject to No_overlap {i in Trabajo, j in Trabajo: i != j and maquina[i] = maquina[j]}:
```

```
abs(FechaComienzo[i] - FechaComienzo[j]) >= (DuracionTrabajo[i] + DuracionTrabajo[j]);
```

Main engine
temperature and
machine speed in
one manufacturing
order



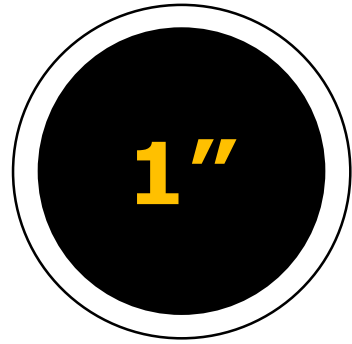
Garrido, Á. L., Rodríguez, J., Sánchez, M., Antón, J. M., Bobed, C., Mena, E.: Heat-Seeker: Real-time Data Integration Using IoT and Semantic Technologies: A Case Study in the Graphic Arts Industry. In: Burjuebo, J. (ed.) Actas de las XXIX Jornadas de Ingeniería del Software y Bases de Datos (JISBD 2025). Sistemas (2025).
<https://hdl.handle.net/14705/JISBD/2825/130>



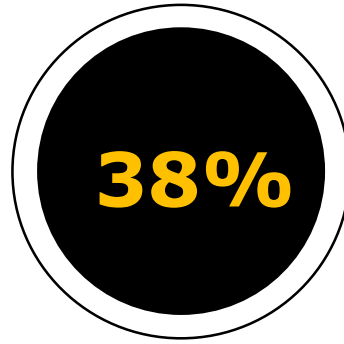
Machine stops due to weekly breaks of workers

Unscheduled stops due to production incidents

Results



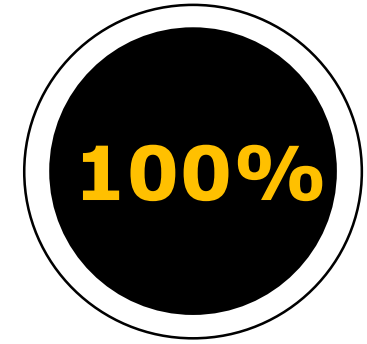
**Immediate
reactivity**



Payback

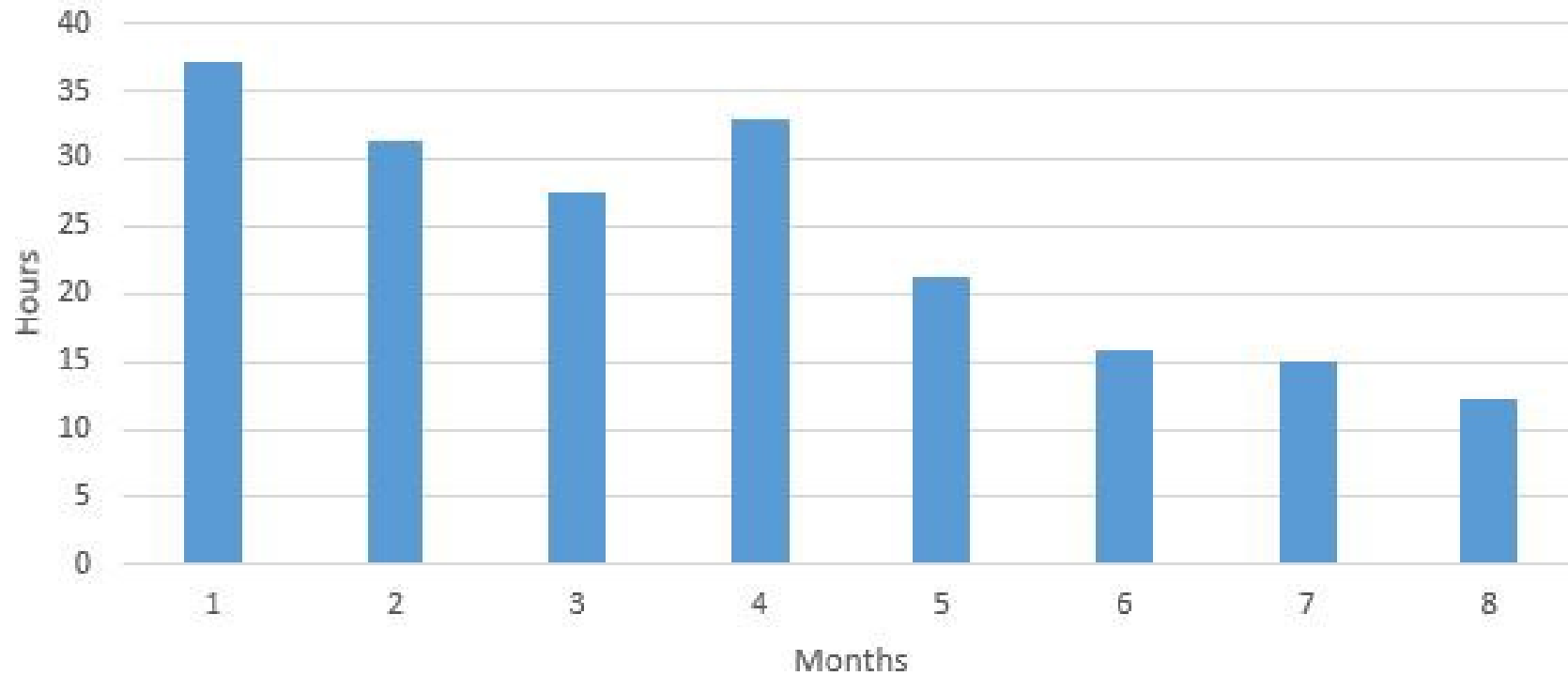


**OEE
Improvement**



**People who
have
immediate
information**

Results



Registered hours of monthly corrective maintenance

Conclusions



- Main benefits of real-time capture implementation for production management: **quality and efficiency**
- Future expectations
 - Scalability: Add more machines
 - Add more signals
 - ✓ *Exploiting uses of the ontology*
 - ✓ *Be able to predict breakdowns with ML*

Thank you for your attention