

From Legacy Systems to Innovation: Real- Time Data Integration in the Graphic Industry

Angel Luis Garrido
Gerente IT
HENNEO MEDIA S.A.

1. Introduction

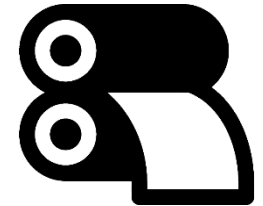
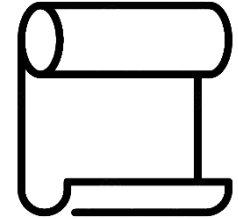




- **HENNEO PRINT** is the business division at HENNEO that is dedicated to the development, printing and handling of different products
- The company acts as a global printing services supplier, offering comprehensive printing solutions for the design and development of editorial products and publications, large formats and graphic arts: daily, weekly, fortnightly and monthly publications, magazines, catalogues, leaflets, etc.
- Until 2020, the plant could only handle coldset jobs (newspaper quality) because the necessary machinery was not available to produce **heatset jobs**



- Newspapers: In the last decade > 50% of the income from circulation and advertising has fallen
- 40% drop in revenue for the sector and decrease in advertising (paper+digital) by -39.7%; with a loss of seven share points in advertising investment.
- Reduction in average circulation of 28.98% compared to 2019.
- 29.13% reduction in advertising revenue on paper.
- Reduction of digital advertising revenue of 9.47%



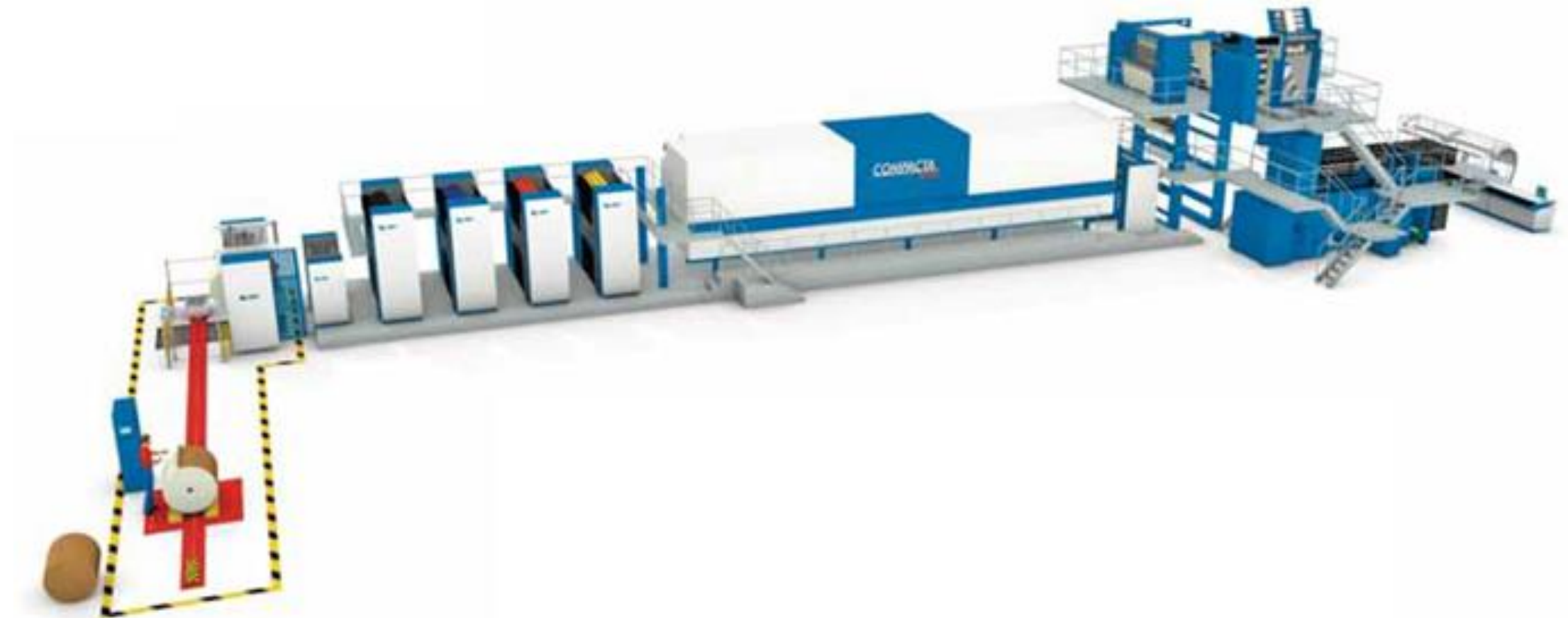


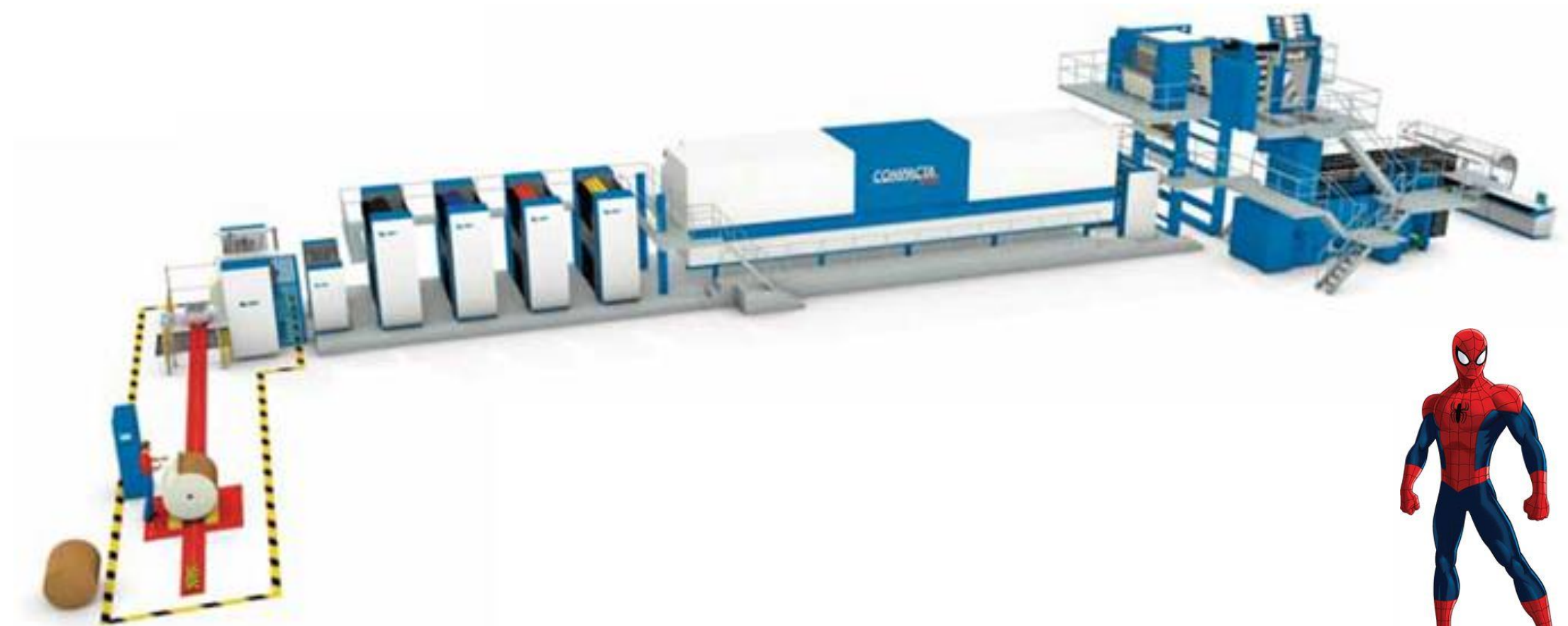
- ✓ Maximize digitization in all business areas.
- ✓ Seek a transformation that allows the continuity of the industrial business (**HEATSET**)

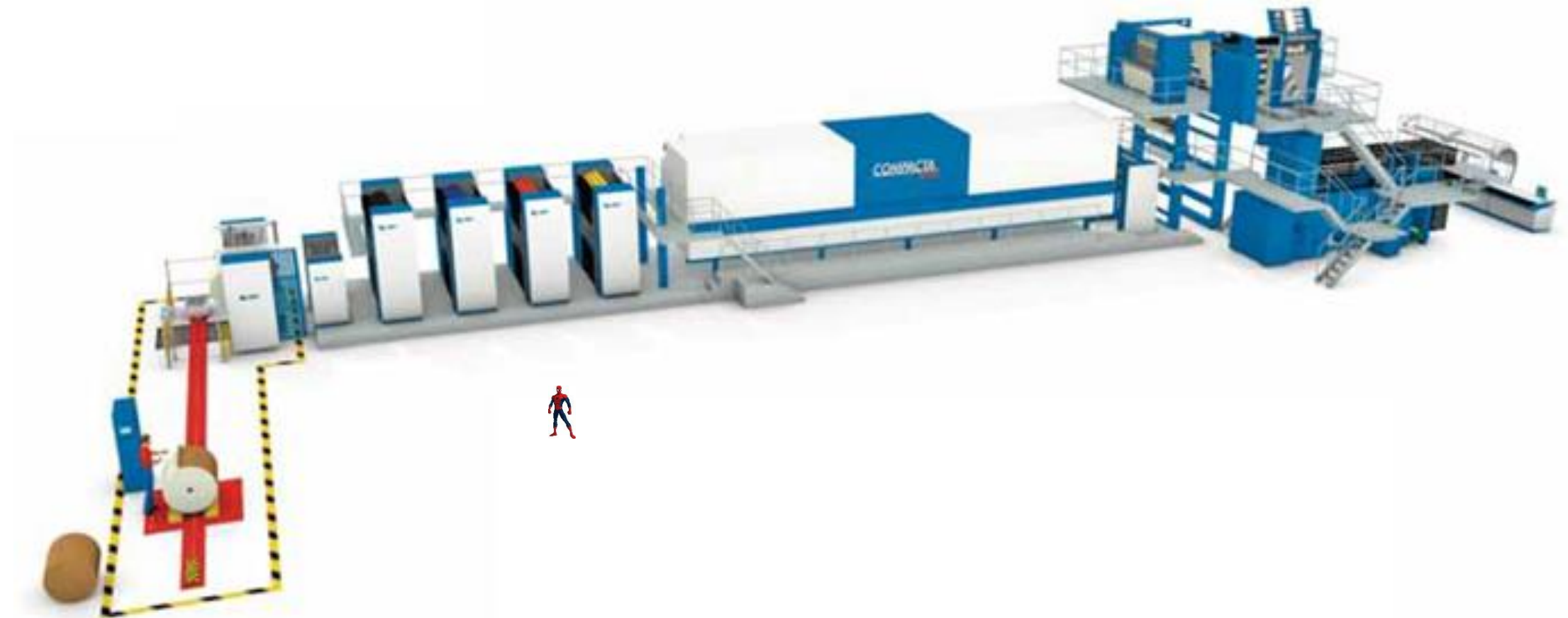
- The proposal is to design a comprehensive management framework, called **Heat-Seer**, that acquires and manages real-time information from old machinery and legacy systems.
- This is achieved through sensorisation techniques and Artificial Intelligence technologies.
- This approach is currently undergoing testing in collaboration with **Henneo Print**, a typical printing plant, where coldset and heatset manufacturing processes coexist with heterogeneous legacy systems.



2. INDUSTRIAL CONTEXT: THE HEATSET BUSINESS





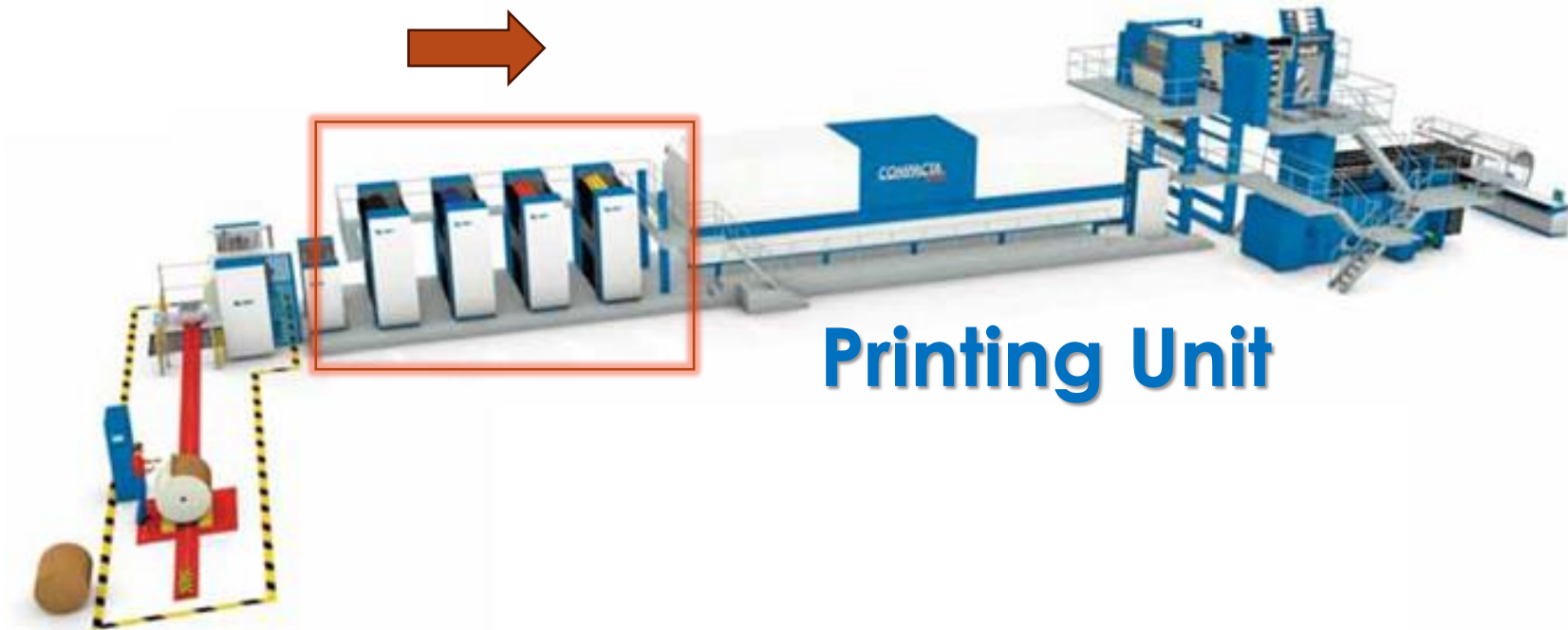


Heatset

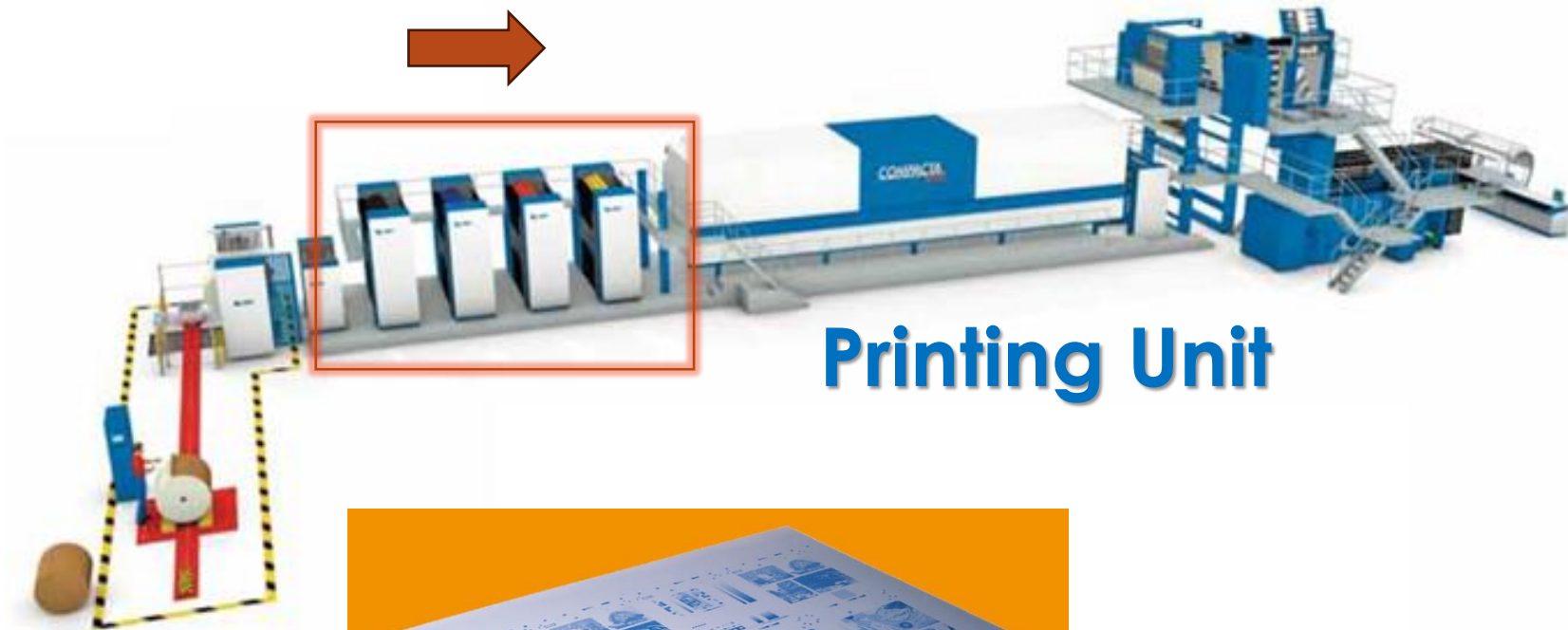


Paper reel





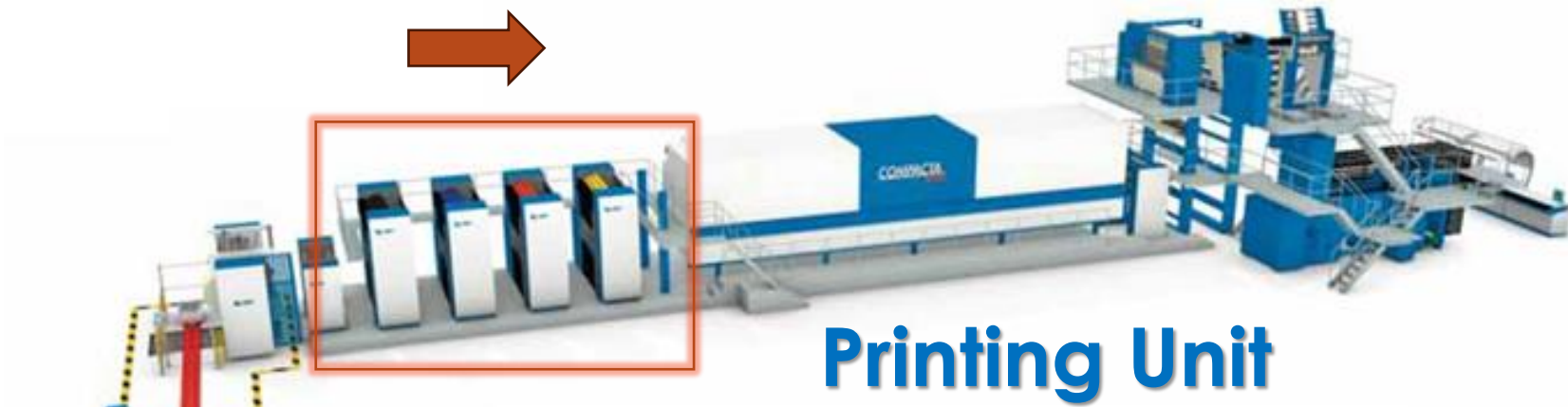
Printing Unit



Printing Unit

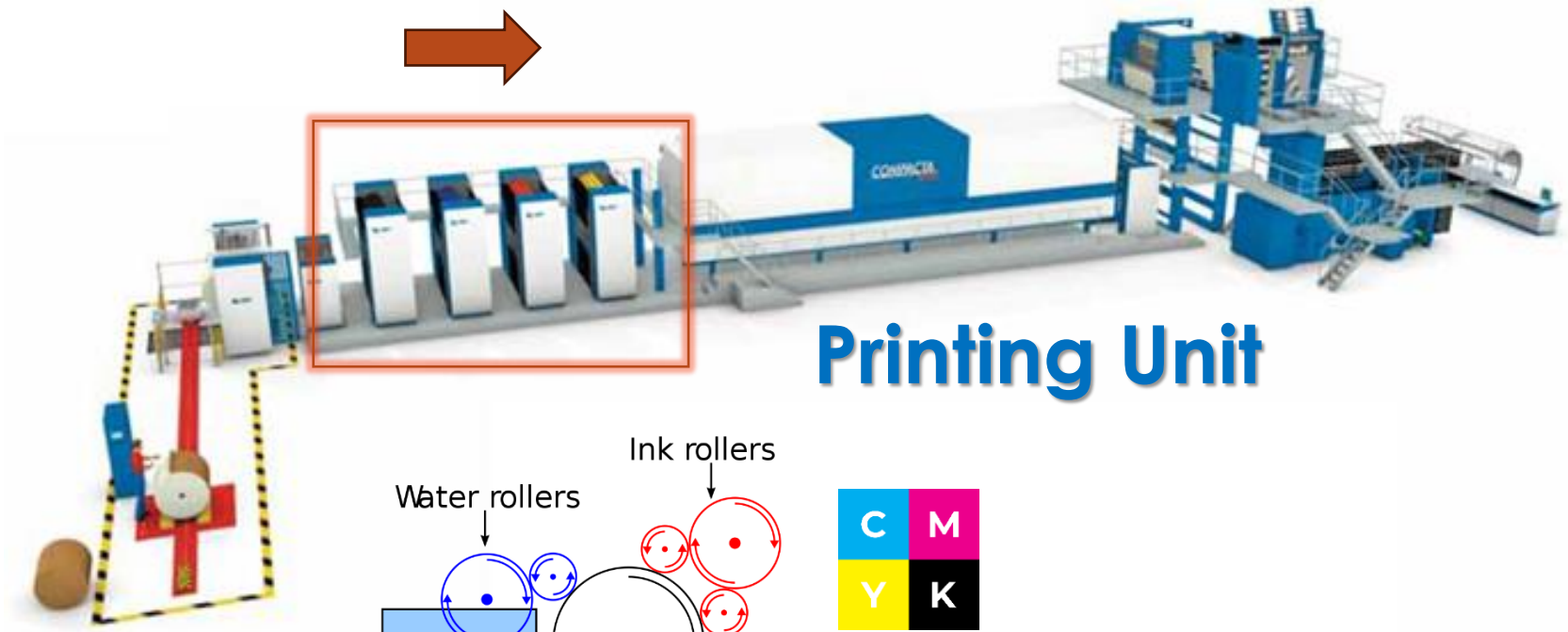


Big Plates

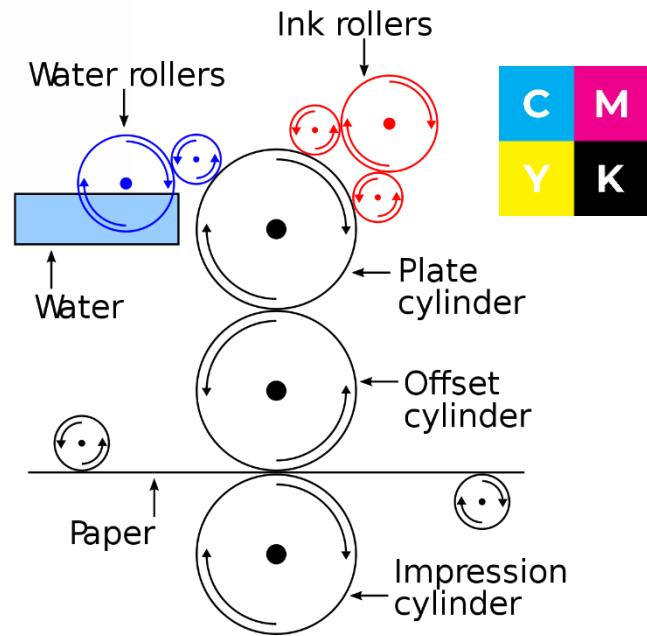


Big Plates



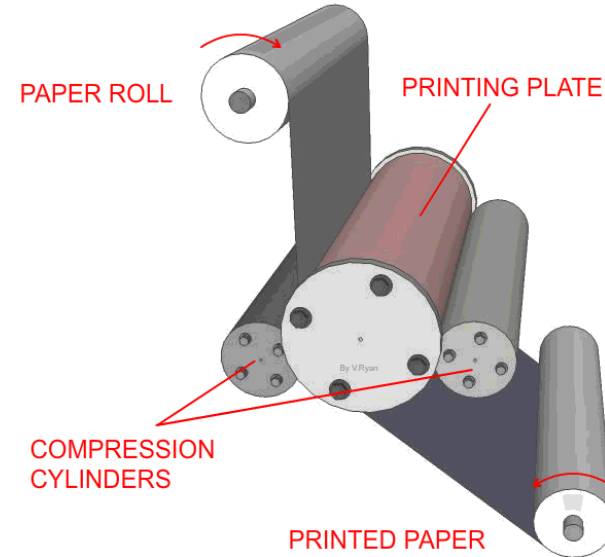
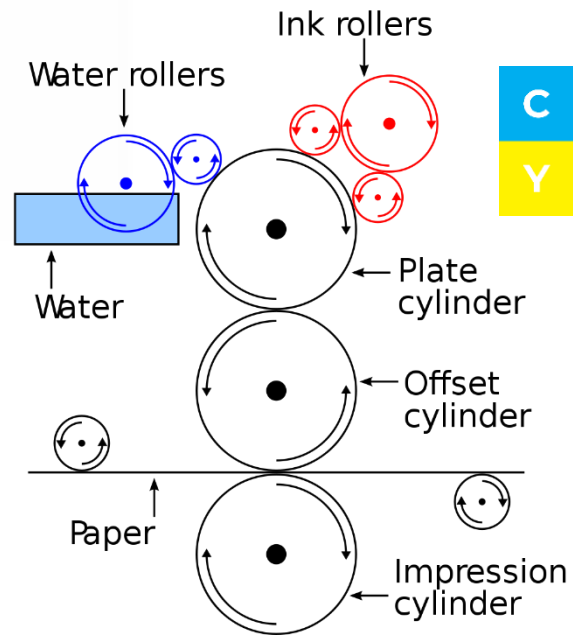


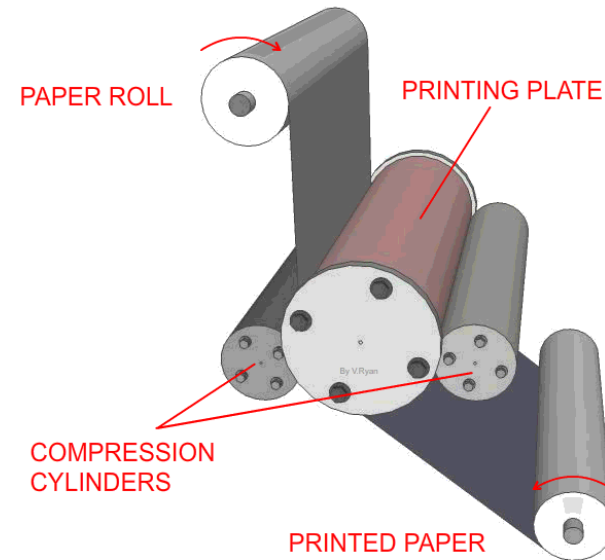
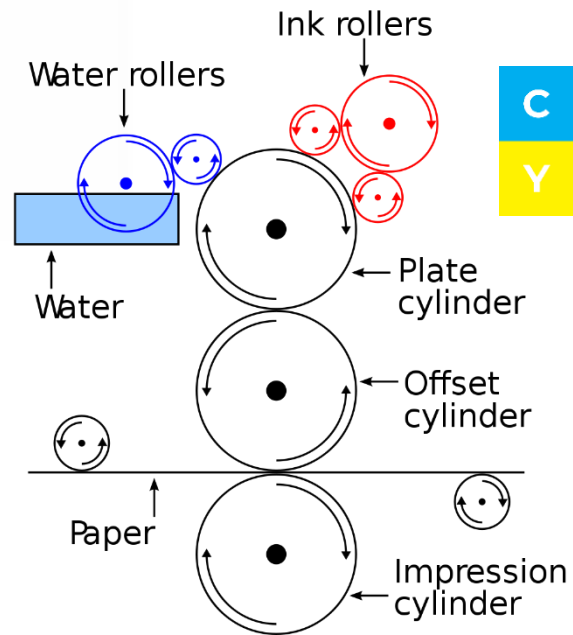
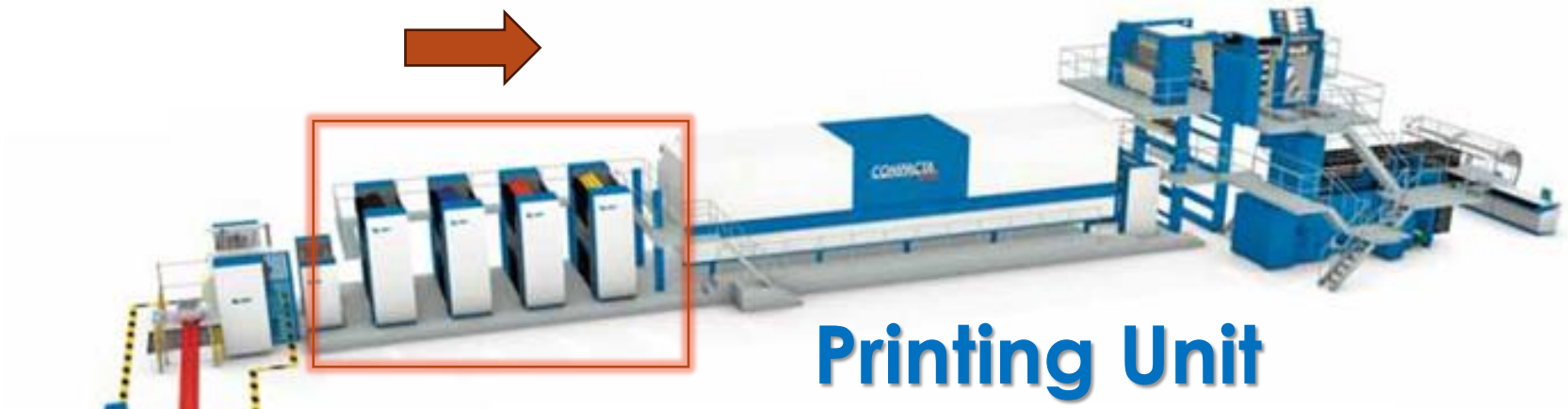
Printing Unit





Printing Unit



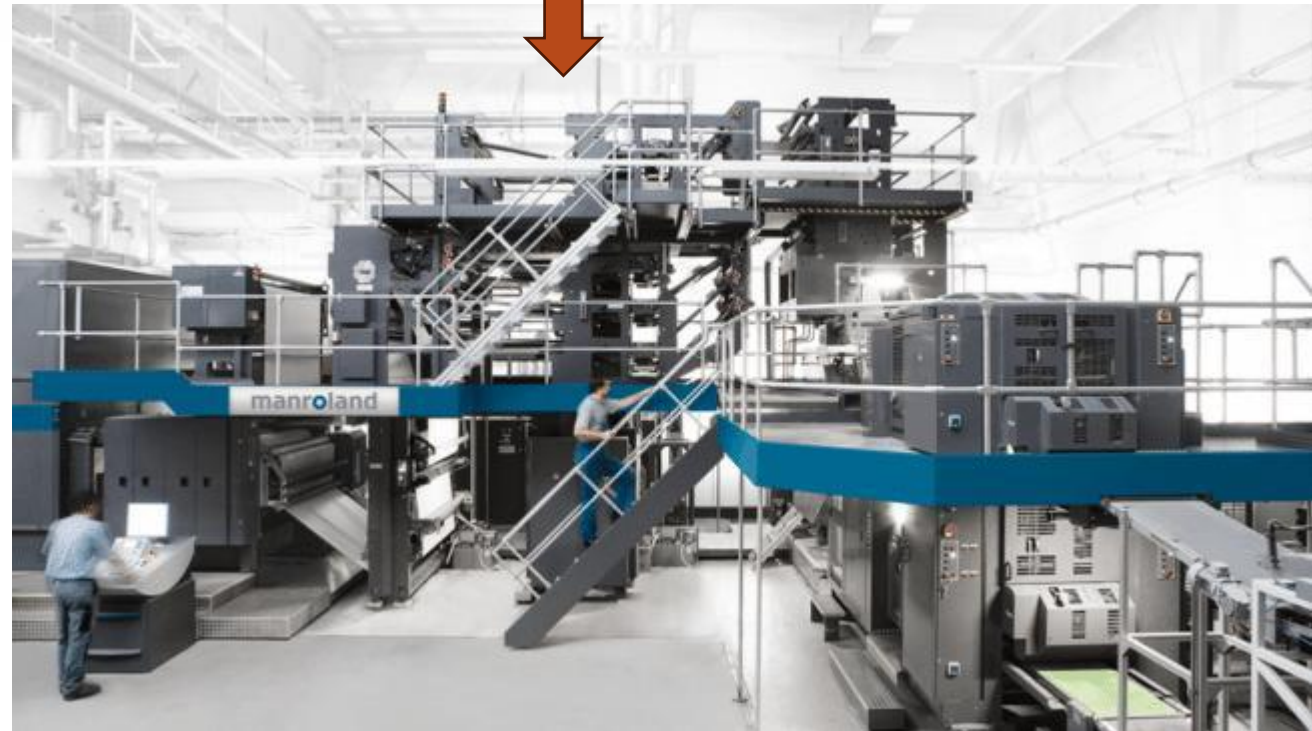


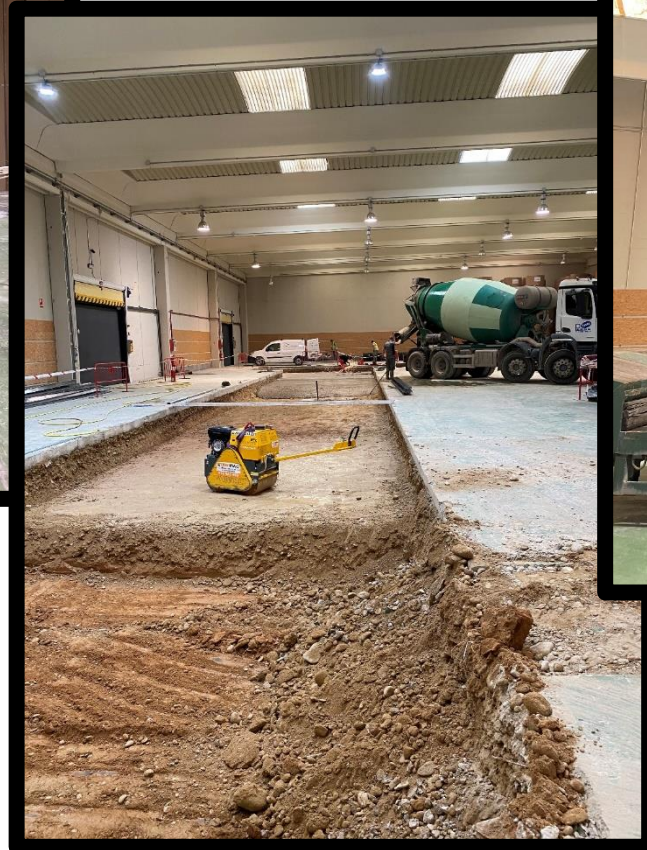


Printing Dryer



Big Folder



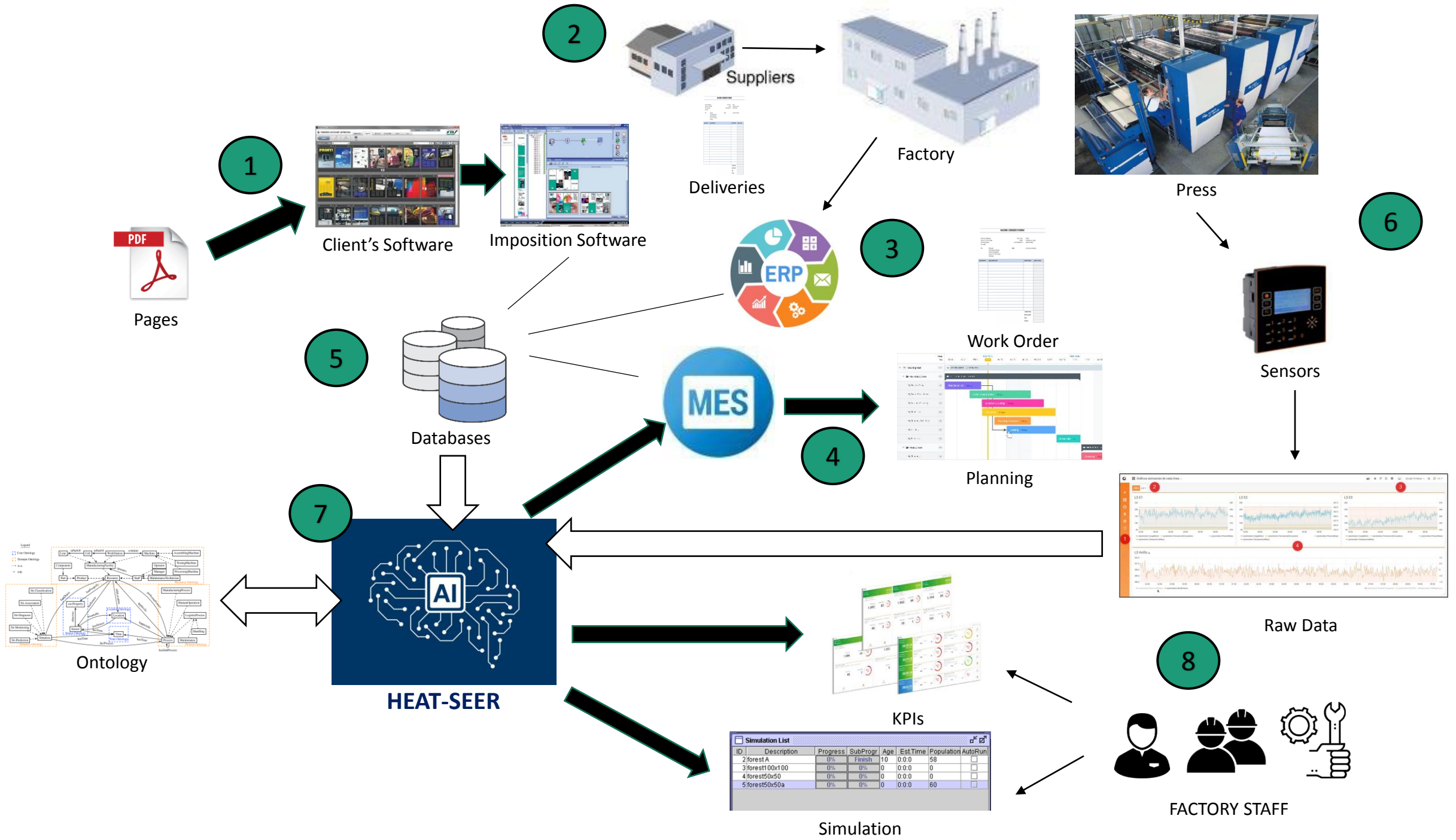




3. THE PROJECT

The heatset business demands the highest quality and efficiency, and it forces it to make investments in assets that imply the creation of new production lines.

So, the general objective of the project is to develop an **integrated management platform in real time for Heatset-type presses** for the automation of processes based on IoT and BigData enabling technologies that allow the capture of productive information in real-time.



Pages

1



Client's Software

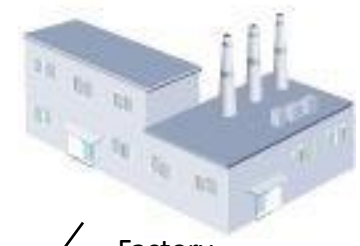


Imposition Software

2



Suppliers



Factory



Deliveries



Press

6



Sensors

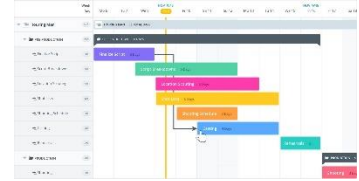


ERP

3



Work Order



Planning

4



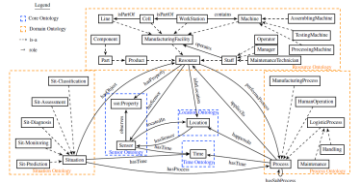
MES

5

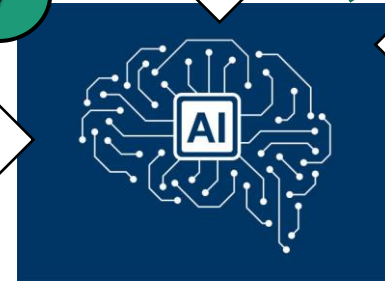


Databases

7



Ontology



HEAT-SEER



Raw Data

8



FACTORY STAFF



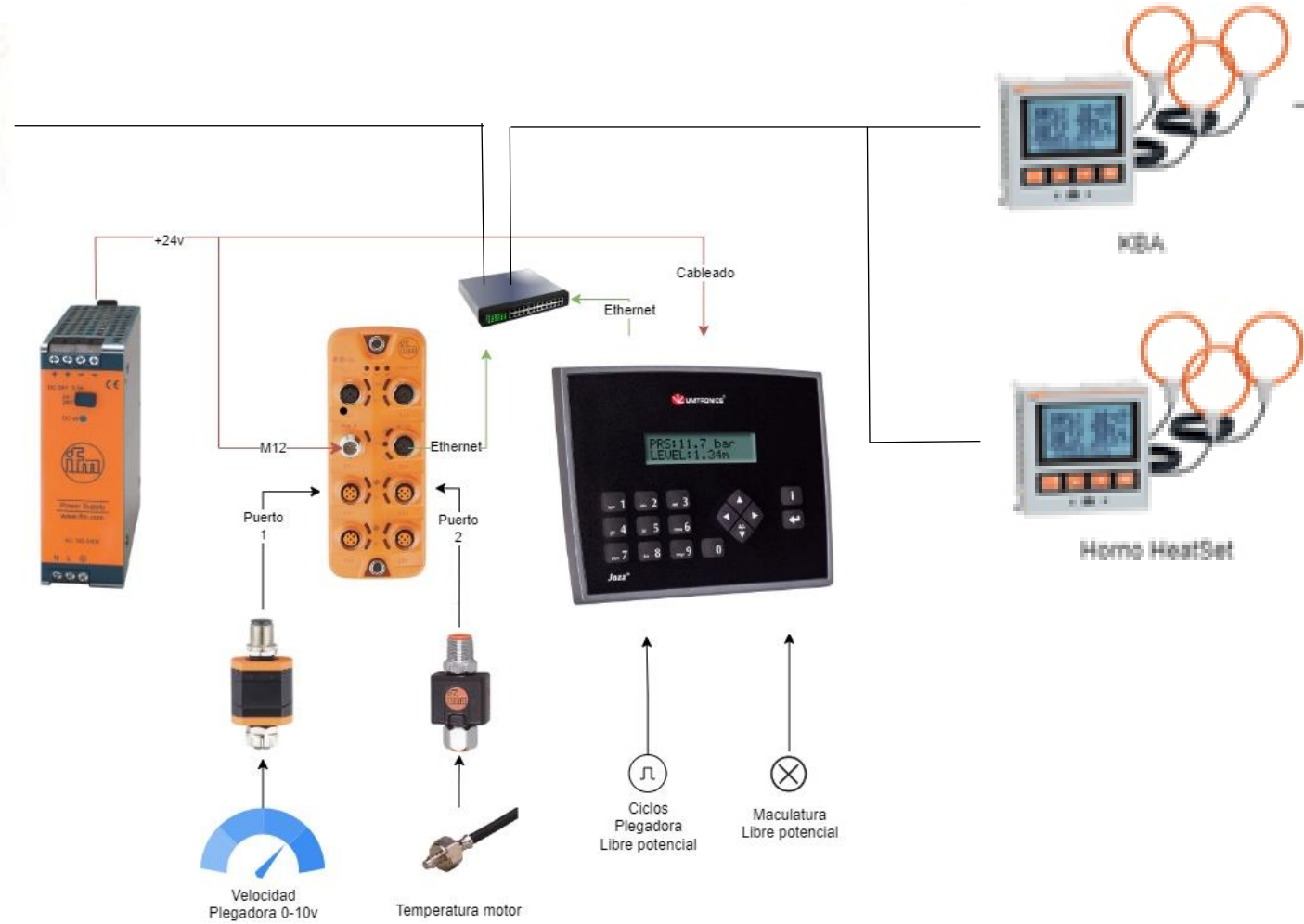
KPIs

ID	Description	Progress	SubProg	Age	Est Time	Population	AutoRun
2	forest A	0%	Finish	10	0:0:0	58	<input type="checkbox"/>
3	forest1100x100	0%	0%	0	0:0:0	0	<input type="checkbox"/>
4	forest50x50	0%	0%	0	0:0:0	0	<input type="checkbox"/>
5	forest50x50a	0%	0%	0	0:0:0	60	<input type="checkbox"/>

Simulation



hiberus[®]
TECNOLOGIA



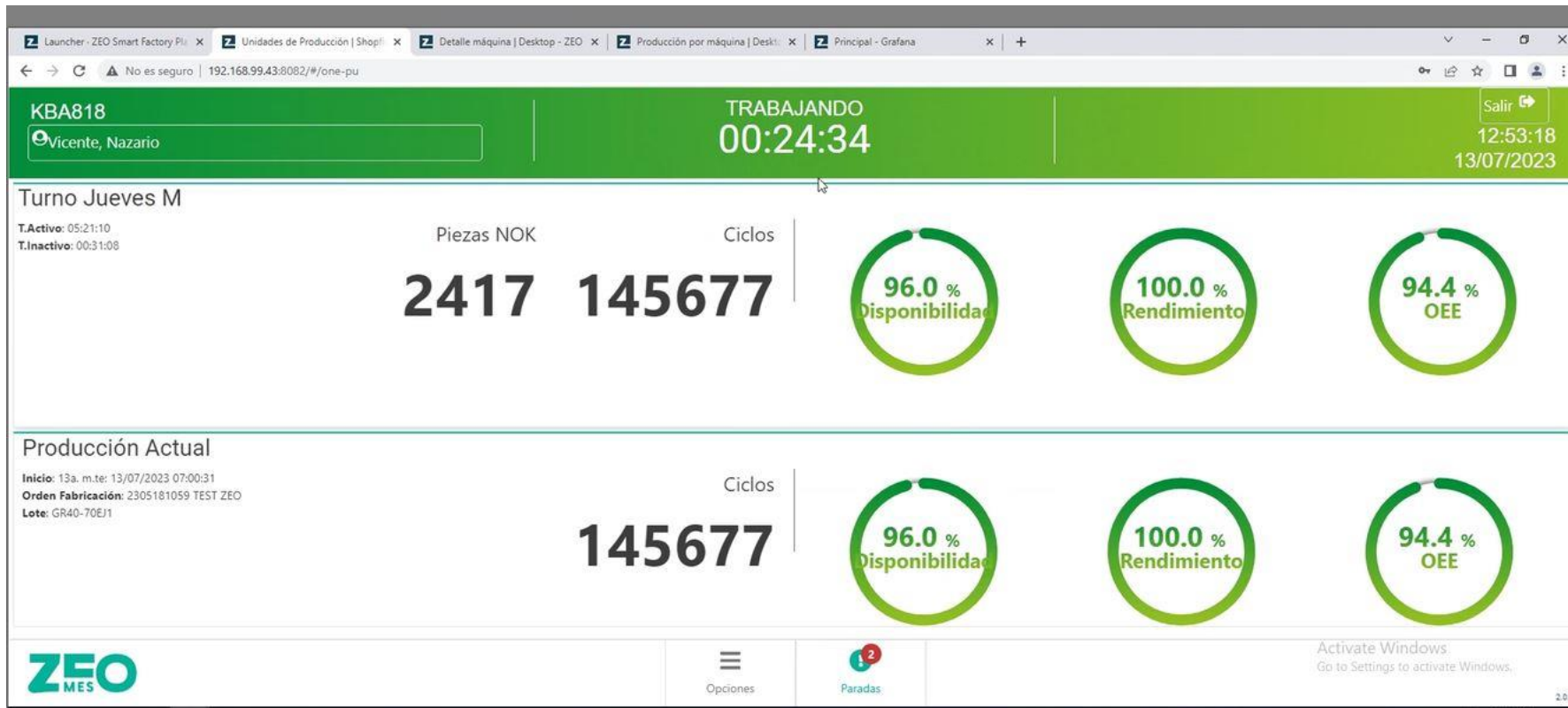


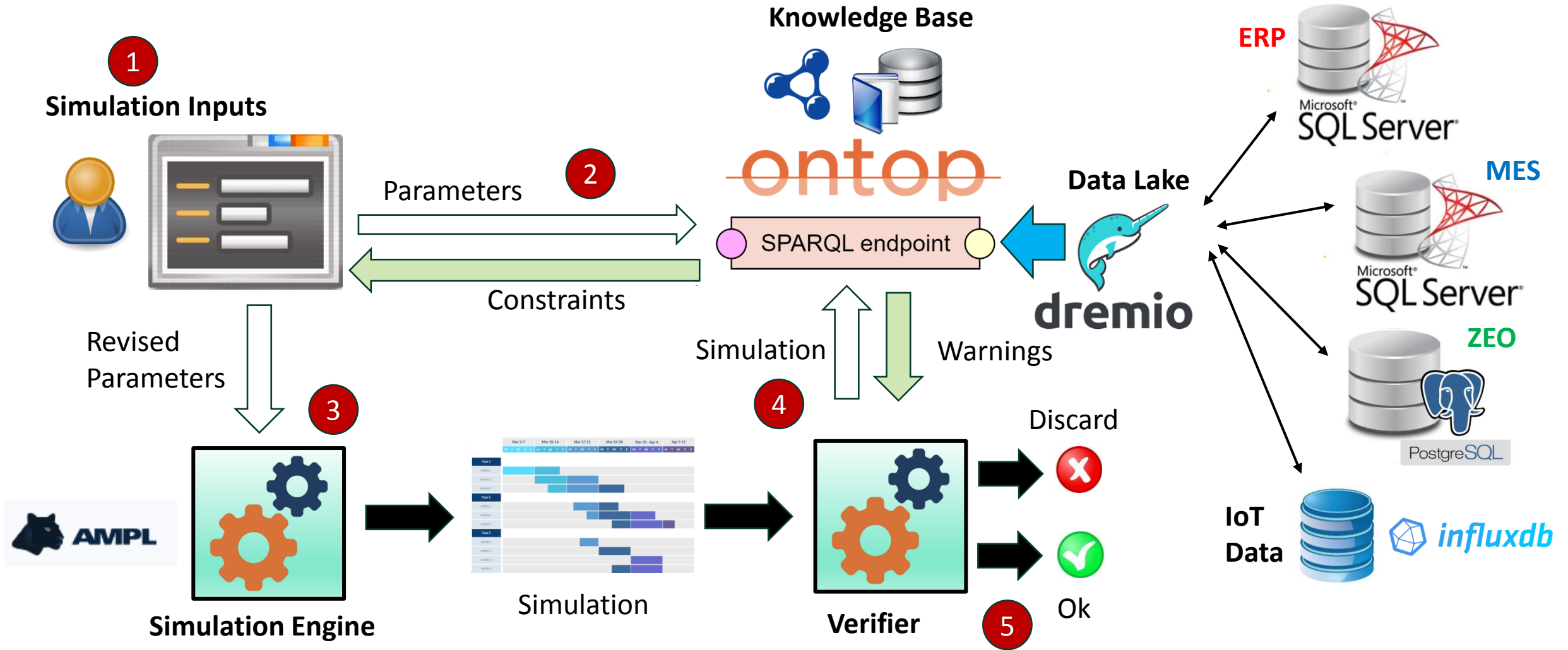


Sensorization



Data seen by the production operator of a manufacturing order





21 abr. 2023
22 abr. 2023
23 abr. 2023

Emisión	Recepción AAF	Fin Impresión	Inicio Impresión	Recogida	Entrega al cliente
20/02/2023 - 18:09	18/04/2023 - 18:07	20/04/2023 - 18:30	20/04/2023 - 17:00	25/04/2023 - 20:07	26/04/2023 - 18:07

PARTE nº 100276

Código: 100276 OT Principal: 0 Presupuesto: 0

Número de pliegos: 1 Número de variantes: 1 Referencia cliente: Confirmado cliente Prueba de color necesaria

Publicación: Mia Cliente: ZINET MEDIA GLOBAL S.L. Agente comercial: QUIQUE QUINTANA

Datos / Nº: ESPECIAL HOROSCOPO 139

Descripción: 1x64 Pedido: nº 48626

Orden de Trabajo Orden de Transporte Documentos

Fechas Previstas

Emisión: 20/02/2023 - 18:09 Inicio Impresión: 20/04/2023 - 17:00 Recogida: 25/04/2023 - 20:07

Recepción AAF: 18/04/2023 - 18:07 Fin Impresión: 20/04/2023 - 18:30 Entrega al cliente: 26/04/2023 - 18:07

Femos Prueba Color

Información

Línea de Salida: KBA818 Canal: FTP cliente Ejem: 17.050 Nº Pág: 64

Maquinas: KBA818 Tipo de Producción: Acumulado 210 x 273

Tipo Producto: Caballete Formato producto: A4 Ancho X Alto (mm) Netos

Curvas: SCA-SCB Peso ejemplar bruto: 0 Peso ejemplar neto: 0

Papel

Revoluciones netas facturación: Kg Papel Necesarios: 2427 Tamaño bobina: 1712

Pliegos X Rev: Kg Papel Consumidos: 0 Papel Cliente Gramaje: 52

OT	Nº Ejemplares	Fecha Inicio Impresión	Línea de Salida	Fecha Fin Impresión
100283	17050	20/04/2023 17:00	KBA818	20/04/2023 18:30

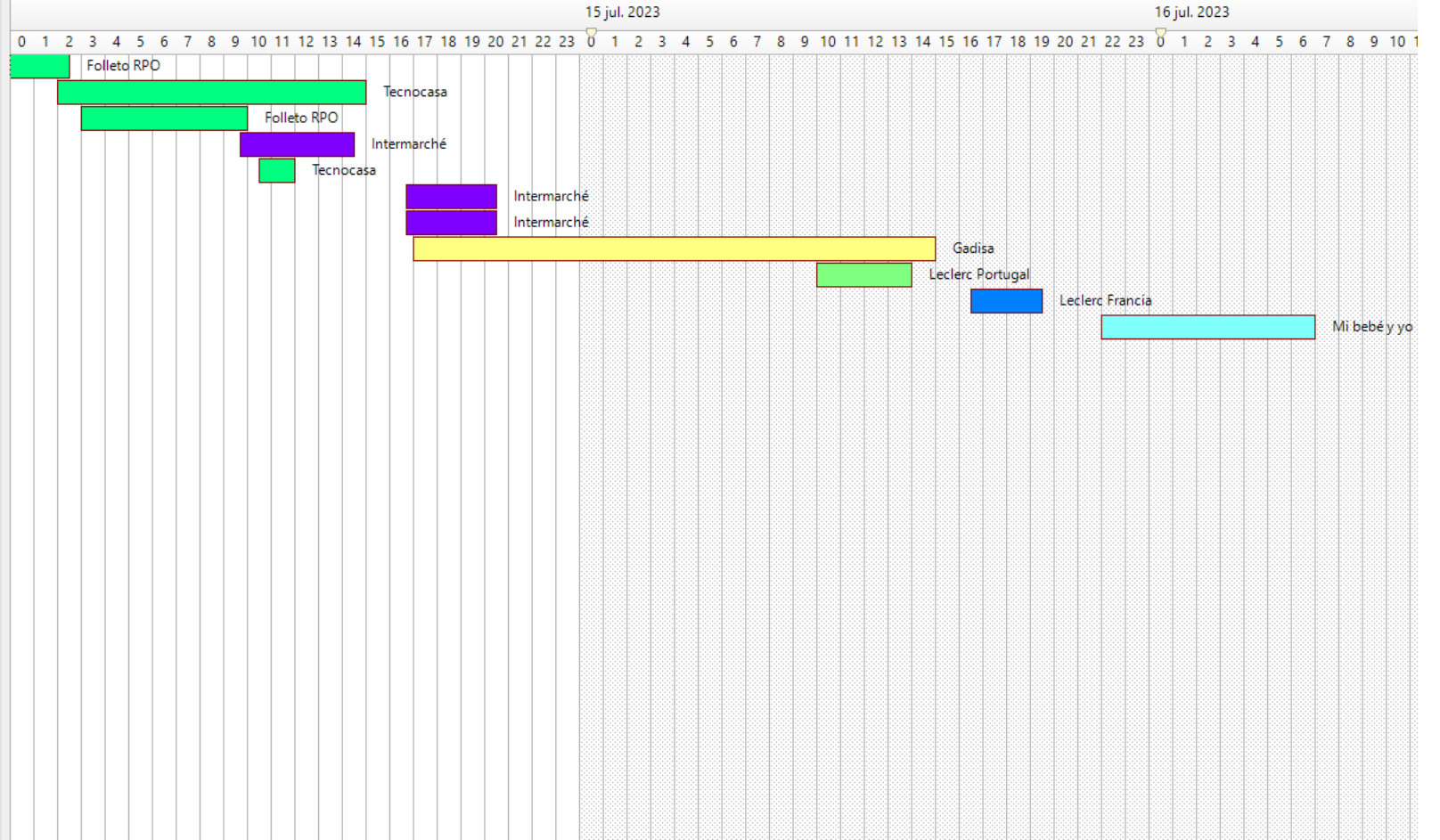
F3 Entregas Papel F4 Publicación F5 Cliente F6 Encargos F7 Variantes (3T) F8 Enviar 3T F11 Expedición F12 Guardar ESC Salir

Planificador de Producción HENNEO PRINT

Exportar Visualizar Filtrar Mostrar Acciones

Lista de Tareas

	IdOrdenTrabajo	Publicacion	Nombre	Inicio imp
▶	100.345	Folleto RPO	FERIA DE VINOS FRESCOS GRANDE	14/07/2023
	101.989	Tecnocasa	EDICION 10	14/07/2023
	100.347	Folleto RPO	FERIA DE VINOS FRESCOS PEQUEÑO	14/07/2023
	101.965	Intermarché	RENTREE DES CLASSES	14/07/2023
	101.990	Tecnocasa	EDICION 33	14/07/2023
	101.973	Intermarché	AOUT 2 CT1	14/07/2023
	101.974	Intermarché	AOUT 2 CT1	14/07/2023
	101.991	Gadisa	PEDIDO 10. V1_GALICIA/CASTILLA Y LEÓN	14/07/2023
	102.121	Leclerc Portugal	23U092	15/07/2023
	101.844	Leclerc Francia		15/07/2023
	101.862	Mi bebé y yo	355	15/07/2023
	102.123	En bobina	IKEA	17/07/2023
	101.264	Alcampo		17/07/2023
	101.992	Gadisa	PEDIDO 10. V2_LUGO	17/07/2023
	98.246	DIA	DIA SEMANAL 30	18/07/2023
	98.251	DIA	DIA SEMANAL 31	18/07/2023
	101.563	Carrefour	G1	19/07/2023
	98.247	JOURNAL	JOURNAL DE MONTPELLIER N?26	20/07/2023
	98.248	JOURNAL	JOURNAL DE MONTPELLIER N?26	20/07/2023
	98.249	Semanal Más y Más	SEMANAL MAS Y MAS 356	20/07/2023
	102.167	Intermarché	GROSS VOLUMES AOUT	20/07/2023
	101.435	Leclerc Portugal	23U095 - Folheto Nao Alimentar Quincenal	21/07/2023
	98.250	Journal de Béziers	JOURNAL DE BEZIERS N° 49	23/07/2023
	101.376	Sunroad	ZR9 36 PAGINAS	24/07/2023
	101.436	Leclerc Portugal	23U096 - Folheto Fim De Semana	24/07/2023
	98.252	Semanal Más y Más	SEMANAL MAS Y MAS 357	27/07/2023
	101.662	Intermarché	NETTO S34	27/07/2023
	101.437	Leclerc Portugal	23U098 - Folheto Fim De Semana	31/07/2023
	98.253	DIA	DIA SEMANAL 32	01/08/2023
	100.183	Soleil	ILES & MOYEN ORIENT 2023 - 2024	01/08/2023




HEAT SEER - Simulador

Fecha Inicio OT Fecha Fin OT

Rotativa

- Todas
- KBA818
- Lthoman
- V7





Fecha Inicio Simulacion Modo Simulacion



```
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 almacen (hacerlo lo mas tarde posible)
minimize Tiempo_total_en_almacen:
    sum {k in Trabajo} (FechaMaxRecogida[k] - FechaFinal[k]);

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];

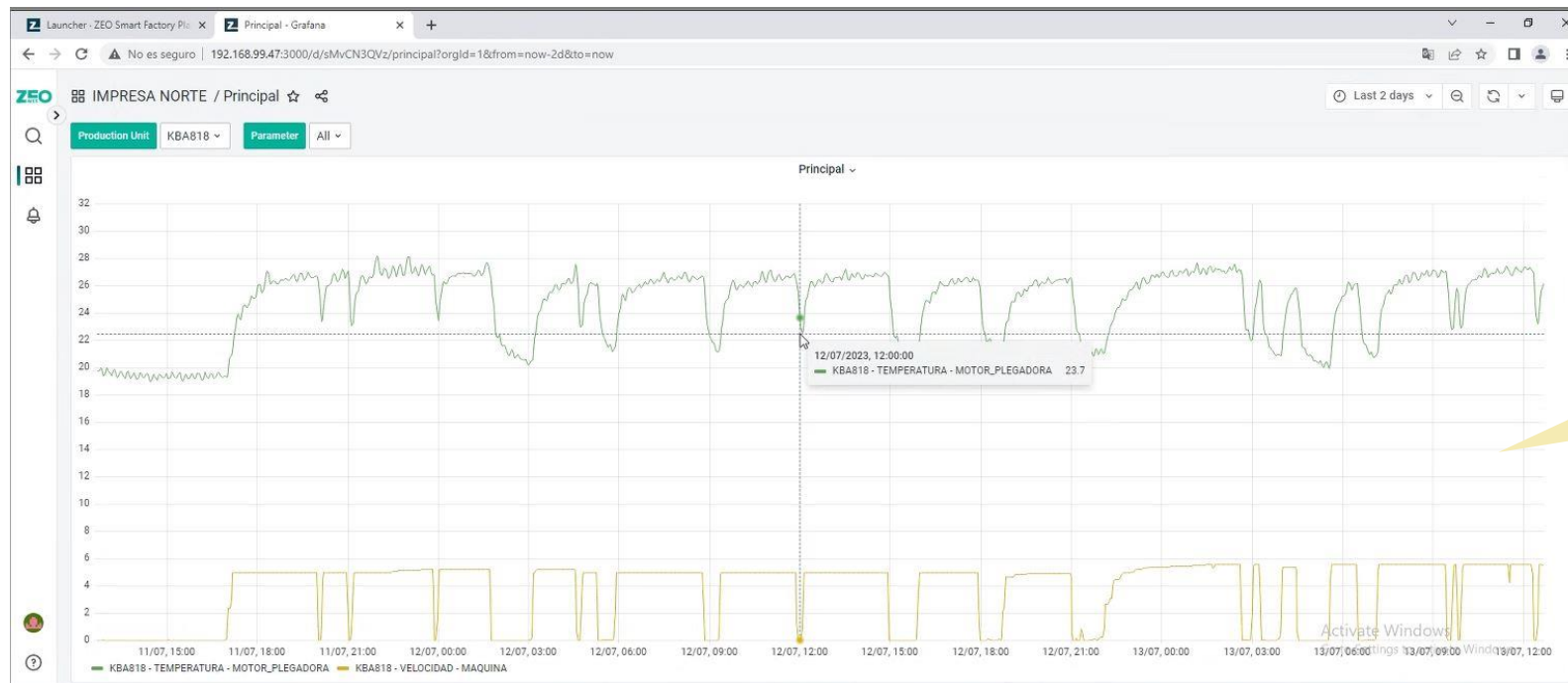
subject to Deben_acabar_antes_de_recogida {i in Trabajo}:
    FechaFinal[i] <= FechaMaxRecogida[i];

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]);
```

4. RESULTS



Main engine temperature and machine speed in one manufacturing order

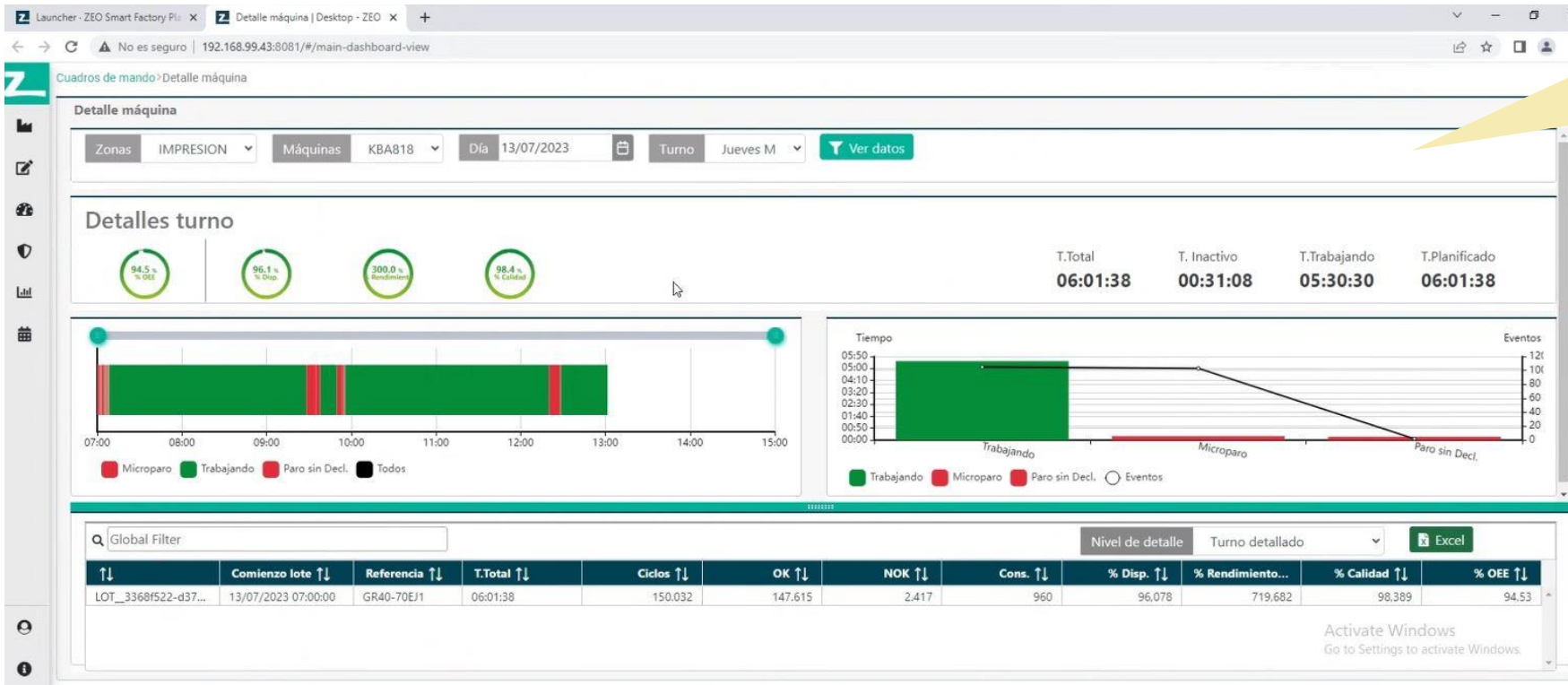


Information can be specified to a date range

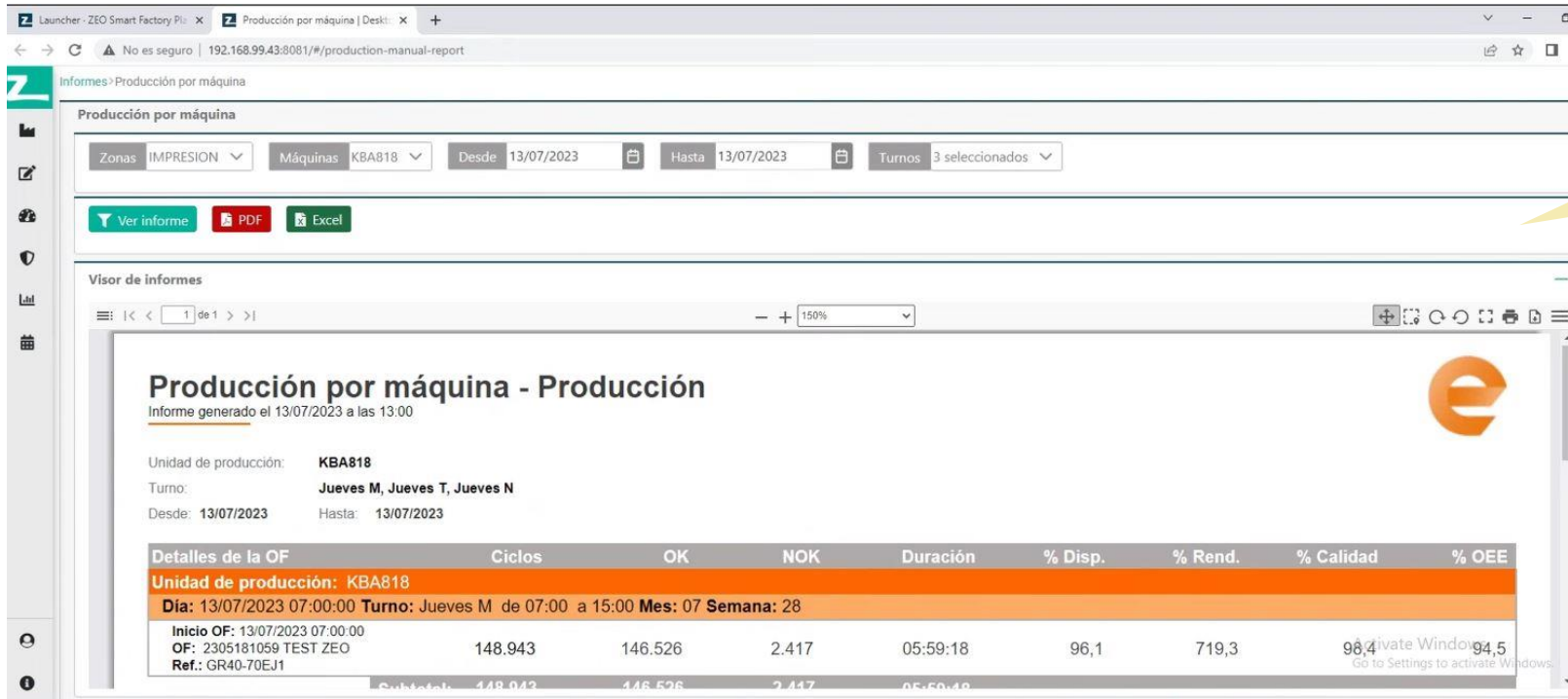


Machine stops due to weekly breaks of workers

Unscheduled stops due to production incidents



Report for the maintenance and production departments



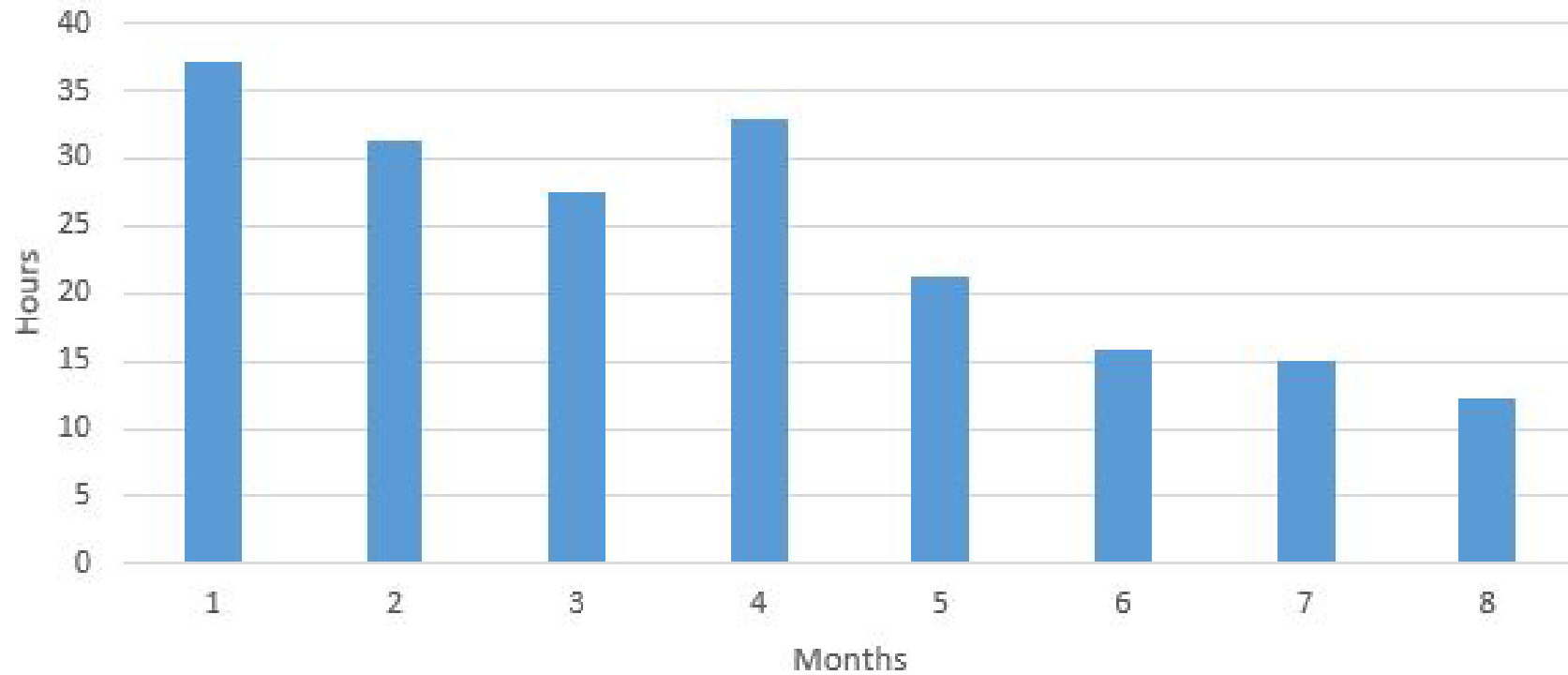
The screenshot shows a web browser window displaying a report titled 'Producción por máquina - Producción'. The interface includes a navigation menu on the left, a filter bar at the top with dropdowns for 'Zonas' (IMPRESION), 'Máquinas' (KBA818), and 'Turnos' (3 seleccionados), and buttons for 'Ver informe', 'PDF', and 'Excel'. The main content area shows report details and a table of production metrics.

Producción por máquina - Producción
Informe generado el 13/07/2023 a las 13:00

Unidad de producción: **KBA818**
Turno: **Jueves M, Jueves T, Jueves N**
Desde: **13/07/2023** Hasta: **13/07/2023**

Detalles de la OF	Ciclos	OK	NOK	Duración	% Disp.	% Rend.	% Calidad	% OEE
Unidad de producción: KBA818								
Día: 13/07/2023 07:00:00 Turno: Jueves M de 07:00 a 15:00 Mes: 07 Semana: 28								
Inicio OF: 13/07/2023 07:00:00 OF: 2305181059 TEST ZEO Ref.: GR40-70EJ1	148.943	146.526	2.417	05:59:18	96,1	719,3	96,4	94,5
Subtotal:	148.943	146.526	2.417	05:59:18				

Personalized reports for other departments



Registered hours of monthly corrective maintenance

5. CONCLUSIONS AND FUTURE WORK





- Mental barriers of workers: This implementation was received as a "thread" instead of an improvement of efficiency
- Determine (choose and discard) which signals must be gathered, looking for quality instead of quantity
- Optimize signals gathering (e.g., some signals could be measured from different approaches)
- Translate those signals with business goals
- Old machines to be sensorized, with obsolete components

- 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 KB*
 - ✓ *Be able to predict breakdowns with ML*



Thank you for your attention

QUESTIONS ??