

MODULE 4

WORKSHEET 3: HYDROGEN STORAGE MANAGEMENT SIMULATION WITH WMS

Substantive introduction

Simulating practical WMS applications allows us to understand the challenges and benefits of its use. In this worksheet, we will focus on managing a virtual hydrogen storage facility, taking into account the specific characteristics of this medium. Remember that hydrogen, especially at high pressure, requires special storage and handling conditions.

In the WMS system, key modules include:

- **Goods receipt:** Delivery records, quality and compliance control.
- **Storage:** Location allocation, space optimization.
- **Picking:** Preparing orders for shipment.
- **Shipping:** Loading and documentation.
- **Inventory management:** Monitoring stock levels, inventory.
- **Batch/Serial Number Tracking:** Critical for security and traceability.

For hydrogen, the WMS should also include:

- **Pressure and temperature:** Monitoring tank storage conditions.
- **Expiration dates/technical inspections:** Tank rotation management.
- **Safety Zones:** Separation of different hydrogen types or tanks.
- **Specialized equipment:** Managing the availability of forklifts adapted to Ex zones.



Task objective: Simulating warehouse operations using WMS in the context of hydrogen.

Scenario: You're the team responsible for managing a hydrogen warehouse that has just received a large shipment of tanks. You need to receive them, properly store them, and prepare them for shipment to several customers.

Instruction:

1. Delivery: You receive a delivery list (Appendix 1). In the WMS system, you must:

- Register a new delivery by entering the details of each tank (type, pressure, production date, last test date).
- Allocate appropriate, safe storage locations in the warehouse, taking into account safety zones and space optimization (you can create a simplified warehouse plan on paper).

2. Inventory Management: Review "Inventory Status" (Appendix 2). Identify which tanks are approaching their next inspection date.

3. Picking and Shipping: Prepare orders for three customers (Appendix 3). In the WMS system, you must:

- Register orders.
- Select tanks for completion, preferring those that require early shipment (e.g. due to the test date).
- Update inventory after picking.
- Generate shipping documents (e.g. waybill, handover protocol).

Appendix 1: Sample Delivery Table

ID Tank	Tank Type	Pressure (bar)	Production Date	Date of Last Inspection	Status (new/used)
H2-001	High-pressure	350	[15.01.2024]	[1.06.2024]	New
H2-002	High-pressure	350	[15.01.2024]	[1.06.2024]	New
H2-003	Low-pressure	200	[20.11.2023]	[10.05.2024]	Used

Appendix 2: Sample Inventory Table

ID Tank	Tank Type	Pressure (bar)	Production Date	Date of Last Inspection	Lokalizacja Magazynowa	Status
H2-004	High-pressure	350	[1.09.2023]	[15.04.2024]	A1-01	Available
H2-005	Low-pressure	200	[10.02.2024]	[1.07.2024]	B2-05	Available

Appendix 3: Sample Customer Order Table

Client	Order ID	Required tanks (ID)
Client A	Z-001	H2-001, H2-004
Client B	Z-002	H2-003
Client C	Z-003	H2-002

Tips:

- You can use cards, a board, or a simple spreadsheet to simulate how a WMS works.
- Focus on the logical flow of information and decisions.
- Remember the "first in, first out" (FIFO) or "first out, first out" (FEFO) principle, especially in the context of technical inspection dates.
- Consider how a WMS would help you complete these tasks faster and more safely in reality.

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