



# DEGREE OF OPERABILITY OF WINTER MAINTENANCE MACHINERY (WMM)

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<sup>(1)</sup> **WMM**: *Winter Maintenance Machinery*

<sup>(2)</sup> **ROMM**: *Road Operation and Maintenance Machinery*

# 1. Introduction (1/2)

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## 1.1 Context

Economic pressure is a common fact which conducts inevitably to search for an **optimization** always bigger of the **fleets of Winter Maintenance Machinery**

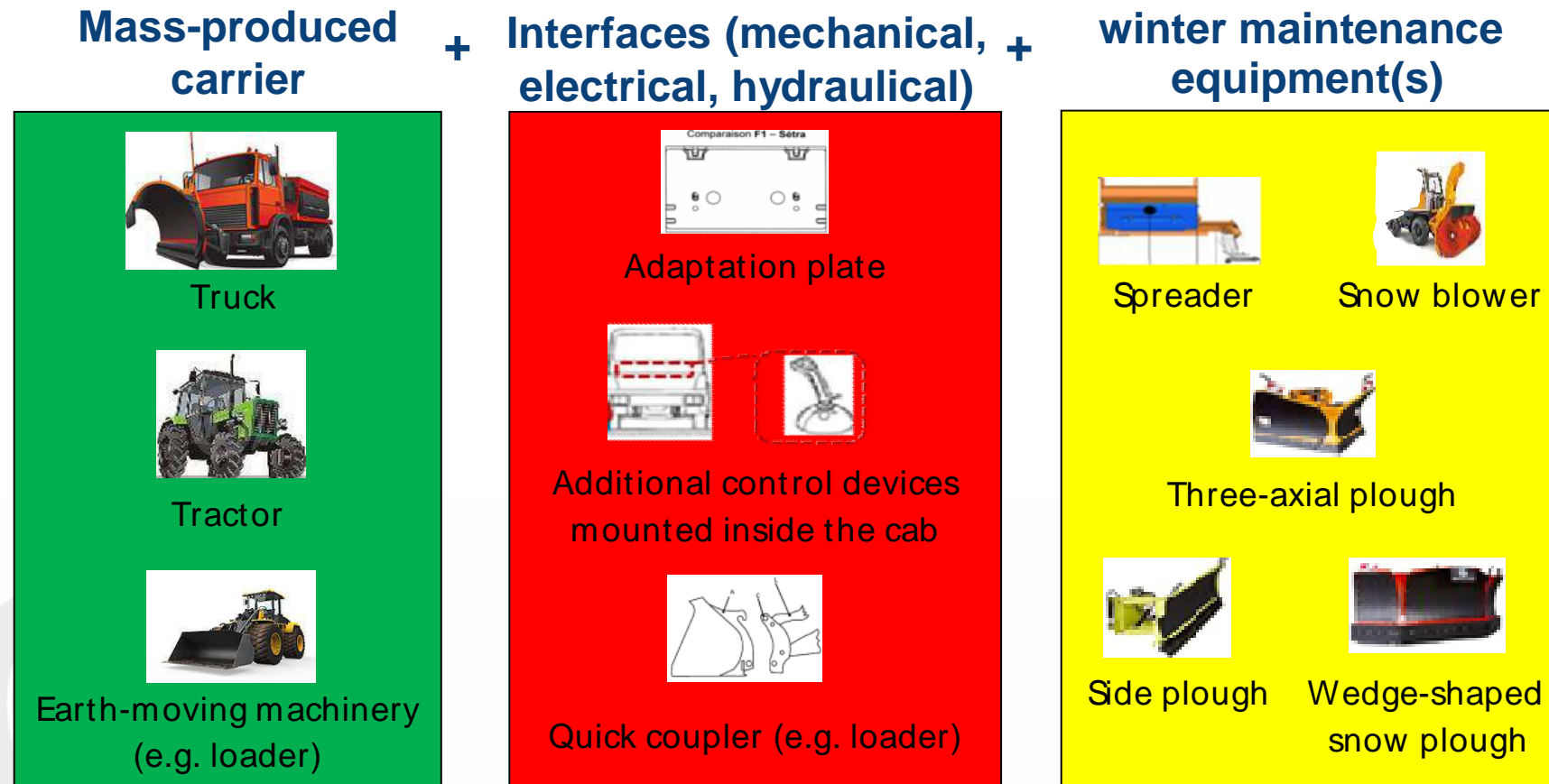
## 1.2 Purpose

Several strong trends in France and Europe regarding the evolution of **Winter Maintenance Machinery**

They are the result at least of the breaking down of some important technical barriers which were a blockage to improve the **degree of operability of Winter Maintenance Machinery**

# 1. Introduction (2/2)

## 1.3 What is a typical Winter Maintenance Machinery ?



## 2. Growing operability of Winter Maintenance

### Machinery in Europe (general trend)



## 2. Growing operability of WMM in Europe (1/11)

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### 2.1 Increasing demand for mixed spreading machinery (trend in France)

Trend since 2010 in France, which is the result of :

- definition of a clear boundary for the **choice of spreading products in link with pavement condition**



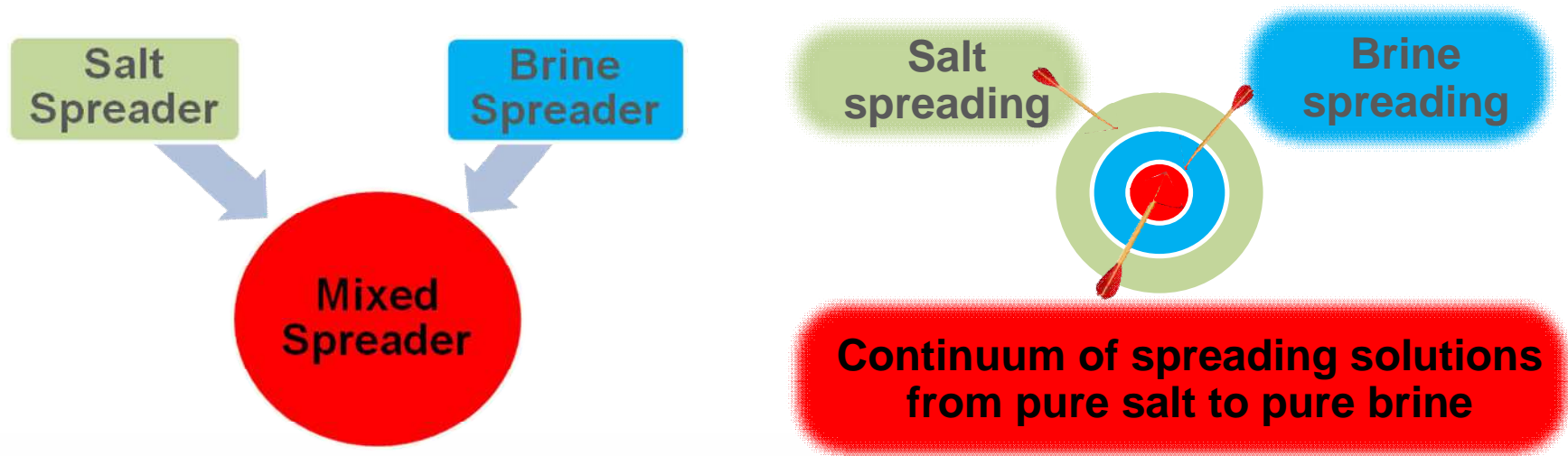
*Source: French Ministry of Ecology, Sustainable Development and Energy*

- wish to **limit the use of salt**
- **success stories** with motorway companies
- **new machinery design** to make possible the spreading of different products on the same machinery

## 2. Growing operability of WMM in Europe (2/11)

### 2.1 Increasing demand for mixed spreading machinery (trend in France)

What is a mixed spreading machinery ?



- A combination of technical characteristics of a salt spreader and a brine spreader
- Offering a continuum of spreading solutions from pure salt to pure brine through variable brine content in salt mixture

## 2. Growing operability of WMM in Europe (3/11)

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### 2.1 Increasing demand for mixed spreading machinery (trend in France)

**Multi-purpose character of mixed spreaders is obtained by:**

- a size review of salt hopper or a particular design of the salt hopper



Front brine tank



Lateral brine tank

- a brine extracting system (in addition to the salt extracting system)
- dedicated spreading systems



Spraying bar & spreading disc

- a new control system integrating all functions



## 2. Growing operability of WMM in Europe (4/11)

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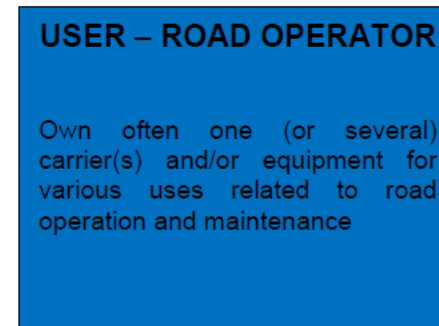
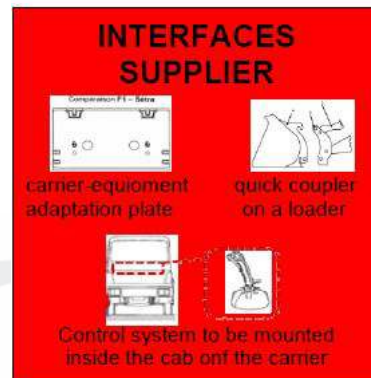
### 2.1 Increasing demand for mixed spreading machinery (trend in France)

**Need:** better adaptability of spreading machinery to the pavement condition, in the service of **salt savings** and **precise road treatments** (e.g. passage of tricky points such as bridge, forests, etc)

**Technical challenge solved:** make possible a coexistence on the same carrier-chassis of all systems needed for storage, extraction and spreading of all products and review the control system

## 2. Growing operability of WMM in Europe (5/11)

### 2.2 Increased operability of machinery for others uses (trend in Europe)

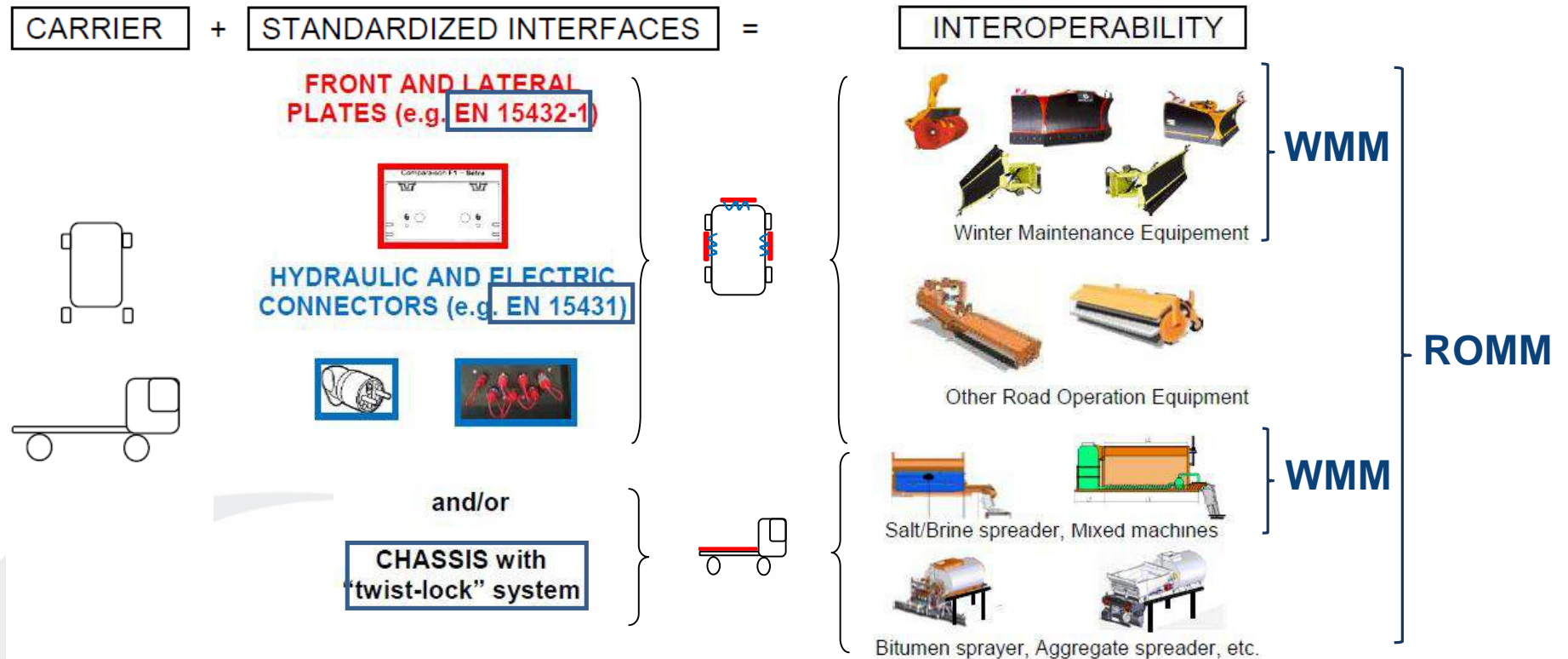


Interoperability : “ability of **several systems** (e.g. carrier, equipment) to **communicate** and **operate** together without any ambiguity or conflict”

## 2. Growing operability of WMM in Europe (6/11)

### 2.2 Increased operability of machinery for others uses (trend in Europe)

#### 2.2.1 towards Road Operation and Maintenance Machinery (ROMM)



**Standardized interfaces = Breaking down of technical barriers**  
**Interoperability extended to Road Operation and Maintenance uses**

## 2. Growing operability of WMM in Europe (7/11)

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### 2.2 Increased operability of machinery for others uses (trend in Europe)

#### 2.2.2 Data acquisition and transfer from Machinery

**Trend** : Tool more and more used because it is considered as a **factor of optimization and resources management** for some road operators

#### **Interests**

- Follow interventions in real time (or recorded) of any machines
- Focus the activity of the operator to the driving of the machine
- Modular system in order to fit additional embedded sensors
- Facilitate maintenance and repair
- Define a winter maintenance policy

## 2. Growing operability of WMM in Europe (8/11)

### 2.2 Increased operability of machinery for others uses (trend in Europe)

#### 2.2.2 Data acquisition and transfer from Machinery

MACHINERY +



Native and additional data source



Sensors

STANDARDIZED IC  
PROTOCOL (INTERFACES)



Embedded IC systems  
(data acquisition and transfer)



Software

= INTEROPERABILITY ON A WHOLE FLEET  
OF DIFFERENT VEHICLES



Interoperability concept can already be extended to other fleets of vehicles

→ Open & adaptable communication architecture

→ **EN 15430 parts 1 & 2** standards give a general framework to fulfill

## 2. Growing operability of WMM in Europe (9/11)

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### 2.3 Multi-purposes machinery on dedicated carriers (trend in France)

- **All mass-produced carriers** (tractors, trucks, etc.) **are not really adequate for specific road operation applications** (lack of versatility and some remaining safety/ergonomic issues to solve)
- **More and more constraints on new mass-produced carriers** during the mounting phase (interfaces, additional control system in the cabin)

## 2. Growing operability of WMM in Europe (10/11)

### 2.3 Multi-purposes machinery on dedicated carriers (trend in France)

Opportunities to start a whole redesign with a clean sheet of paper:

→ Interoperability addressed at the design step for all intended uses



## 2. Growing operability of WMM in Europe (11/11)

### 2.3 Multi-purposes machinery on dedicated carriers (trend in France)

#### Opportunities to start a whole redesign with a clean sheet of paper:

→ new advantages in terms of **safety, ergonomic and comfort** for operators



Safe access from the rear of the cab



Cab redesigned to improve visibility and ergonomic



Etc.

→ **Power performances adjusted to the real needs** of intended applications (e.g. fuel savings)



## 5. Conclusion (1/3)

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French managers of machinery fleet show an interest in increased machinery operability, in terms of:

- **Global optimization** of machinery fleet
- **Administrative management**
- **Safety/Ergonomics** (especially with dedicated carriers)
- **Productivity**
- **Resources savings**

at the service of a better safety/ergonomic/comfort for the **operator/driver** and global economy for the **road operator** (administration or company)

## **5. Conclusion (2/3)**

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**All these advantages are more and more significant in times of crisis and are the main reasons of the observable current trends :**

**-increasing demand of mixed spreading machinery**

**-multi-purpose road operation machinery :**

- on mass-produced carrier (interoperability issue)
- on dedicated equipment-carrier (interoperability and other issues)

**-data acquisition and transfer from machinery/vehicles fleet**

## 5. Conclusion (3/3)

Increased operability is a reality today within Europe due to the breaking down of technical barriers, especially thanks to standardization

“Tool”: **CEN/TC 337** <sup>(1)</sup>  
involving all stakeholders



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European platform created and chaired by France since 2000

Set of European standards :

Interfaces

- EN 15432-1
- EN 15431

IC interfaces

- EN 15430-1+A1
- CEN/TS 15430-2

<sup>(1)</sup> **CEN/TC 337**: European Technical Committee of CEN  
“Road Operation Products and Equipment”