

# RAILWAY ROLLING STOCK MAINTENANCE

OCTOBER 12TH, 2018



# CONTAINS

01.

SOME KEY INDICATORS

02.

MAINTENANCE MISSIONS

# 01. SOME KEY INDICATORS

# SOME KEY INDICATORS



**30,000 Km**  
OF TRACK



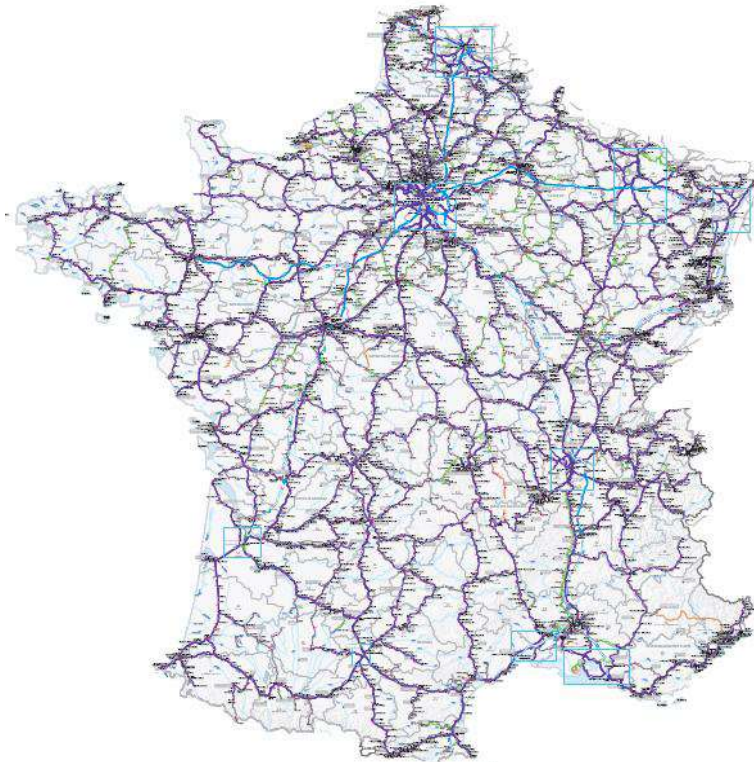
**2,824 Km**  
OF HS LINE



**15,000**  
TRAINS/DAY



(Passengers trains : 800 High Speed Trains, 6000 Intercities & Regional Express Trains, 6200 Commuter Trains for Greater Paris but also 2000 Freight trains and Works trains)



# TO CARRY OUT REPAIRS OR ROUTINE MAINTENANCE ON ALL THESE TRAINS

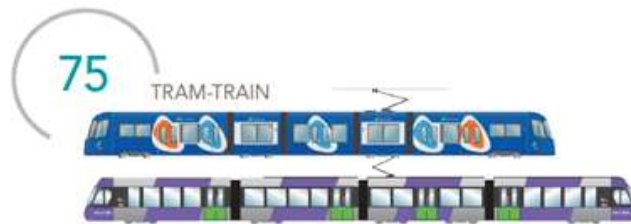
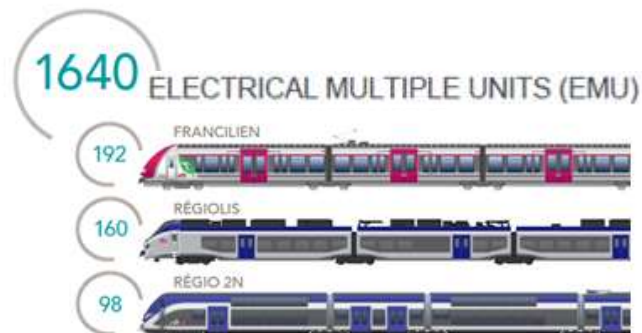
+ 21,500 employees

+ 39 business units



+ €2.7 bn is spent every year on maintaining SNCF rolling stock

# SNCF ROLLING STOCK FLEET



# REGIOLIS MAIN CHARACTERISTICS

- Maximum speed: 160 km/h
- 3 lengths: small (PPP), medium (PPM) and long (PPG)
- 3 layouts: Regional (R), Intercity (I), and suburban (P)
- 2 motorisations: bi-tension (Z) and bi-mode & bi-tension (BB)



Version	Length	Capacity		
		R	I	P
PPP	85m	162	NA	NA
PPM	72m	220	202	228
PPG	110m	354	328	366

# 02.

## MAINTENANCE MISSIONS



# DEFINITION OF MAINTENANCE



## Standard NF EN 13306 X 60-319 :



« Combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it, or restore it to a state in which it can perform the required function. »

# MAINTENANCE POLICY

+ Ensuring that rolling stock is in working order and compliant with:

- . Safety and interoperability requirements,
- . Standards and regulations,
- . The agreed quality, availability and cost targets.



# MAINTENANCE MISSIONS

## MAINTENANCE OF ROLLING STOCK

- + Establish protocols and carry out maintenance to ensure safety, reliability and availability of rolling stock to all rail operations units.

## MODERNISATION AND RENOVATION OF EXISTING ROLLING STOCK

- + Convert rolling stock to adapt it to the requirements of passengers, technological developments, new standards and to extend its lifespan.

## ENGINEERING AND TEST SERVICES

- + Carry out research and development work, technical inspections and homologation of future rolling stock.

## PROCUREMENT MANAGEMENT FOR NEW ROLLING STOCK

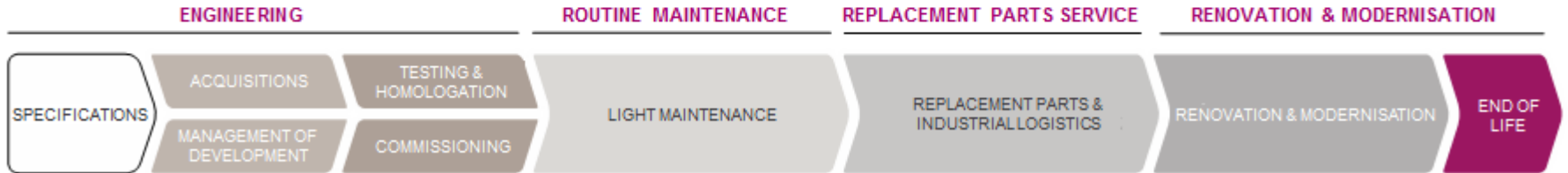
- + Assist SNCF rail operations units to establish their new rolling stock requirements, contribute expertise and design replacement parts procurement strategies and the associated supply chain.



The Rolling Stock division is legally responsible as the Unit in Charge of Maintenance (ECM in French). The entire process of carriage maintenance has obtained official certification, as stipulated by European regulations.

# ROLLING STOCK LIFE CYCLE

THE ROLLING STOCK FUNCTION IS CLOSELY INVOLVED IN EVERY STAGE OF THE ROLLING STOCK LIFE CYCLE



# TYPES OF MAINTENANCE

Before a failure occurs, we talk of preventive maintenance



After a failure occurs, we talk of corrective maintenance

By avoiding failures, we can limit the impact on the rail system as a whole, on quality of service and on the cost of non-quality

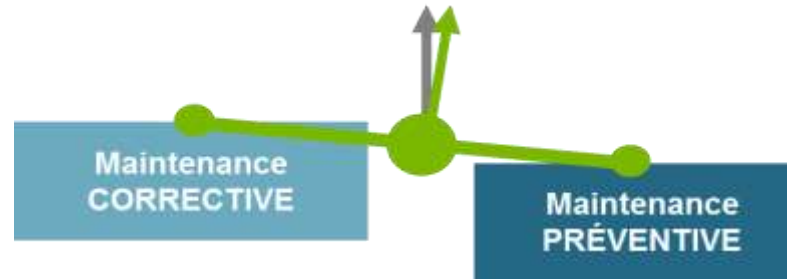
MAINTENANCE IS NECESSARY TO COUNTERACT THE LOSS OF RELIABILITY CAUSED BY AGEING AND USE THAT THREATENS TO UNDERMINE OPERATIONS

MAINTENANCE IS CARRIED OUT WHEN THE OPERATIONS TO RESTORE VEHICLES TO GOOD WORKING ORDER COST LESS THAN PURCHASING NEW ROLLING STOCK (CF. EXEMPLE OF THROWAWAY ITEMS OR CONSUMABLES)

# PREVENTIVE ACTION TO OPTIMISE AVAILABILITY AND COST TO THE CUSTOMER

+ Preventive maintenance helps contain corrective maintenance requirements :

- . Either for operating safety reasons (the consequences of failure are deemed unacceptable),
- . Or on economic grounds (less costly),
- . Or, occasionally, on practical grounds (the equipment is only available for maintenance at certain specific times).



+ The challenge for the engineers is to strike an economic and technical balance between preventive and corrective maintenance.

# ROUTINE MAINTENANCE

LEVELS 1 (IN-SERVICE MONITORING), 2 (EXAMINATIONS ) & 3 (PERIODICAL INSPECTIONS )

## ENSURING TRANSPORT SAFETY, ROLLING STOCK RELIABILITY AND PASSENGER COMFORT

- + Operated by the rail operations units, the power behind maintenance resides in its network of technical centres dedicated to maintenance, which together cover the whole country.
- + This dense network enables maintenance to be carried out close to operations, avoiding empty trips and increasing fleet availability.
- + The key strengths of maintenance which contribute to better safety, reliability and availability :
  - . Technical expertise,
  - . Anticipating requirements,
  - . Extensive use of feedback,
  - . More integrated maintenance.



# RENOVATION & MODERNISATION OF ROLLING STOCK

LEVELS 4 (OPERATIONS TO OVERHAUL) & 5 (MAJOR TECHNICAL MODIFICATIONS )

## EXTENDING THE LIFESPAN OF EVERY TRAIN COMPONENT

- + Renovating and modernising clients' rolling stock so as to incorporate the latest technology; innovating for greater safety, performance, comfort and eco-friendly mobility.
- + Modernisation work is carried out in the Rolling Stock specialist units, the industrial *technicentres*, which have technical expertise and extensive industrial resources.





# PART REPAIR

## CONCERNING HI TECH PARTS WITH A VERY HIGH PRICE TAG

- + Technicians can carry out work on approximately 22,000 different listed rolling stock repairable parts (PRM in French).
- + PRMs are parts on which repair and restoration are both technically feasible and economically profitable.
- + Parts are repaired in the industrial technicentres
  - The main PRM categories are:
    - axles
    - bogies
    - engines
    - HVAC units
    - pantographs
    - electronic components



# PROCUREMENT ENGINEERING

## PROCUREMENT ENGINEERING TO OPTIMISE THE ACQUISITION OF NEW ROLLING STOCK

- + Procurement engineering offers its support and assistance to rail operations units in the purchasing process of new rolling stock.
- + This support is provided in the form of the requirement definition, tender negotiations, contract management, testing supervision and homologation.
- + Clients benefit from an investment modelling software solution which collates the cost of initial acquisition, maintenance costs, their change over time and energy consumption.



- + **5,500 listed suppliers**
- + **160,000 PN in portfolio**  
(8,000 new PN created per year)
- + **17,000 purchasing orders per year**
- + **1,000 contracts submitted to *technicentres***

# THE « TECHNICENTRE » NETWORK

## + 29 maintenance *Technicentres*

- . Routine maintenance
- . Light repairs

The technical centres carry out maintenance 24/7 to ensure operation is not affected.

## + 10 industrial *Technicentres*

- . Renovation and part repairs (axles, bogies, electronic components,...)
- . Modernisation

At mid-life, it takes on average 2 or 3 months to renovate/modernise a Locomotive or a Motor Unit.

## And also:

+ The **Technicampus** (University for Rolling Stock)

+ The **Industrial Logistics Centre** (CLI)

+ The **Rolling Stock Engineering Centre** (CIM) and the **Rail Test Agency** (AEF)

+ The **Technical fleet supervision** (STF)



# TRAINING ENGINEERING : TECHNICAMPUS

- + The TechniCampus, the official University for Rolling Stock, educates SNCF staff in the different specialities of railway maintenance.
- + Training courses offered:
  - **technical subjects:** welding, doors, axles, pantographs, brakes, electricity, railway technology, bolted joints, mechanics, ground-train communications, diesel engines,
  - **cross-disciplinary subjects:** management, railway operation safety, staff safety, human and social operational factors, production management operational excellence, on-boarding programmes for new recruits in all areas, career development programmes.
- + The TechniCampus also manages apprenticeship programmes running from high-school leaving cert to Masters equivalent.
- + The courses make extensive use of innovative and interactive teaching methods and tools (e-learning, virtual reality, e-classes, role plays, etc.)

- + €16 M annual turnover
- + Up to 300 employees trained per day
- + 160 courses
- + 35 members of teaching staff
- + 38 classrooms
- + 1 workshop spanning 1,100 sqm for practical work
- + 80 railway models



# ORGANIZATION OF INDUSTRIAL LOGISTICS :

THE INBOUND SUPPLY LEVEL AND THE OUTBOUND PRODUCTION LEVEL

## « Inbound » Logistics

National stock management

for consumable parts,

Stock management for repairable parts and reserve,

Delivery of spare parts to the technical centres,

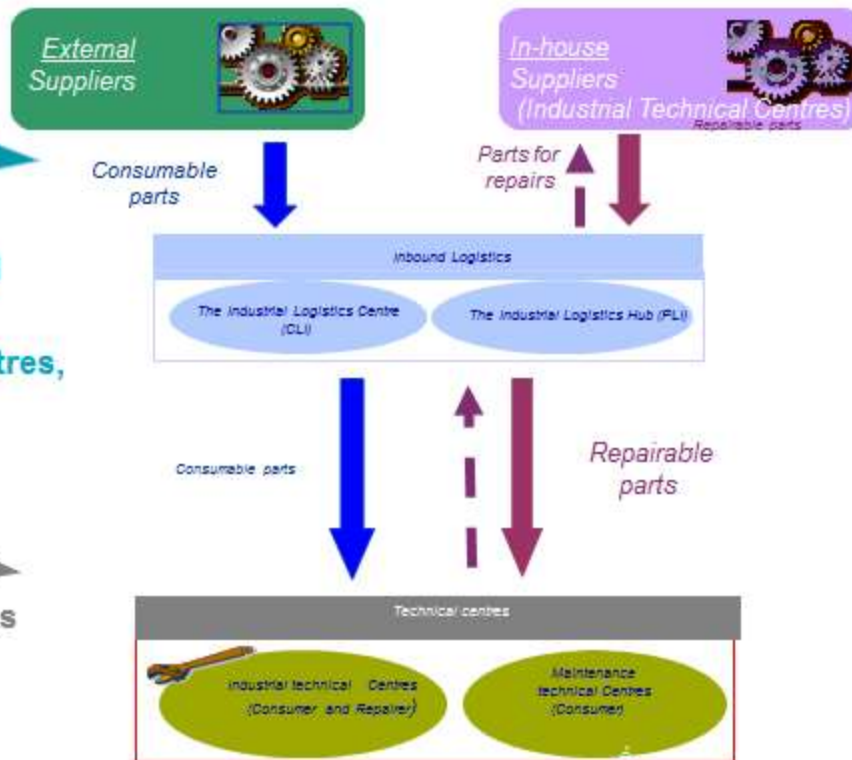
Order forecast for suppliers.

## « Outbound » Logistics

Management of local stocks

Distribution of spare parts within workshops

Expressed need to the inbound logistics  
(forecasting / procurement orders).



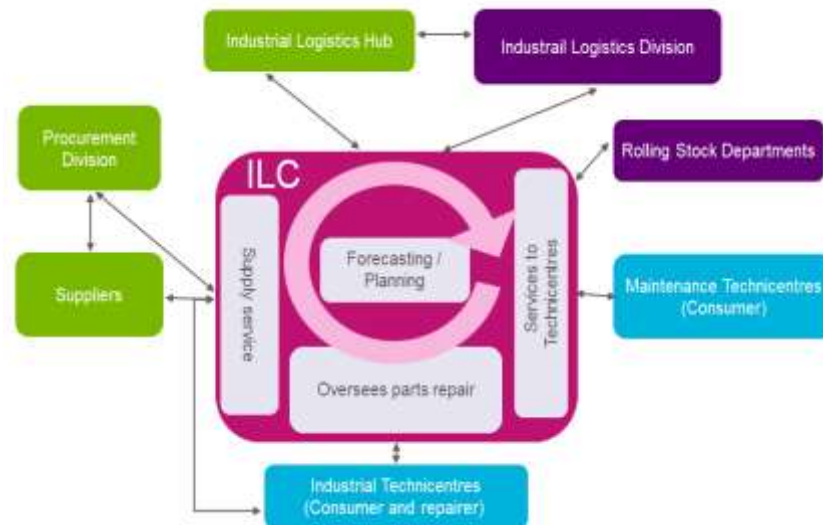
# THE INDUSTRIAL LOGISTICS CENTRE

ENSURING AVAILABILITY OF SPARE PARTS

+ The main purpose of the ILC is to ensure that the Technical centres have all the spare repairable parts (PRM) they need on a daily basis:

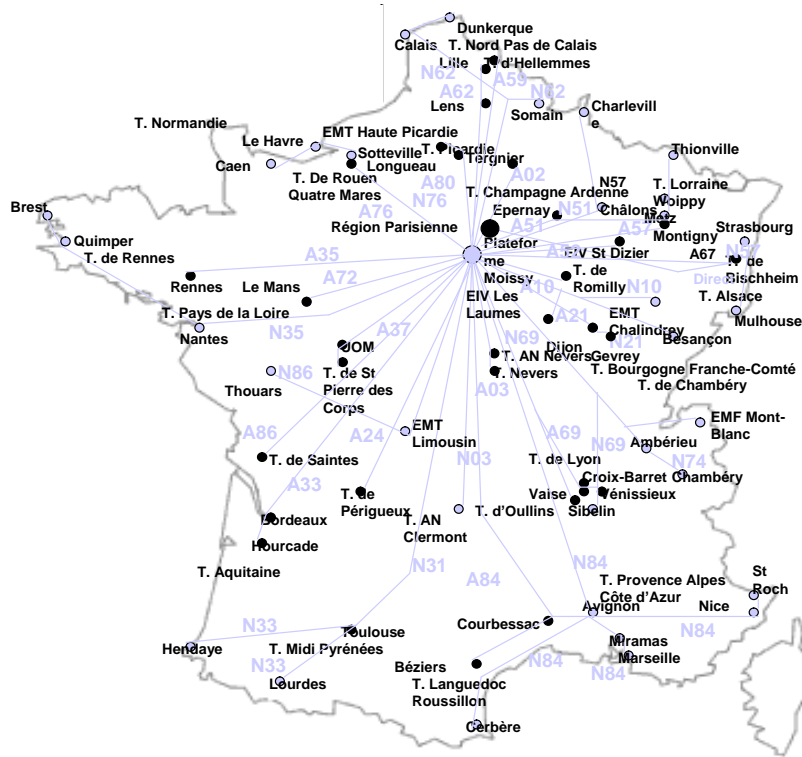
- . at the right time,
- . in the right place,
- . of the quality and in the quantity required,
- . at the best logistics cost.

+ The ILC also supports the establishments and manages crises (shortage of stocks, downtime, etc.) Customer service.



# THE INDUSTRIAL LOGISTICS HUB

ENSURING AVAILABILITY OF SPARE PARTS



Daily transport plan



**Storage site : 70 000 m<sup>2</sup>  
130 000 storing locations**

**2,800 shipments i.e. €2 million  
worth of parts sent out each day**

**415 delivery points  
65 vehicles in daily delivery**

**€ 400 million worth of inventory**

# MAINTENANCE ENGINEERING

FULFILLING OPERATOR NEEDS - ENHANCING ROLLING STOCK KNOW-HOW



- + Maintenance engineering brings together more than 1,600 employees.
- + It provides critically important expertise for rolling stock safety, reliability and development.
- + It designs the innovations and new features of the train of tomorrow: next generation interiors, on-board video, WIFI, LED lighting, etc.



**MAINTENANCE ENGINEERING PLAYS AN ESSENTIAL ROLE IN SPECIFYING OPERATORS' REQUIREMENTS, ESTABLISHING MAINTENANCE PROTOCOLS AND CONDUCTING TESTS**

- + The CIM (Rolling Stock Engineering Centre) determines the technical specifications for new rolling stock.
- + The AEF (Railway Testing Agency) carries out laboratory and on-line testing for new & renovated rolling stock



# TECHNICAL FLEET SUPERVISION

MAINTENANCE MANAGEMENT AND MONITORING



ITS JOB IS TO GARANTEE THE AVAILABILITY, PUNCTUALITY AND RELIABILITY OF ALL MANAGED TRAINS

Transport plan

Rolling stock positioning

Maintenance appointments

Operational management of fleet maintenance  
Monitoring technical condition of rolling stock

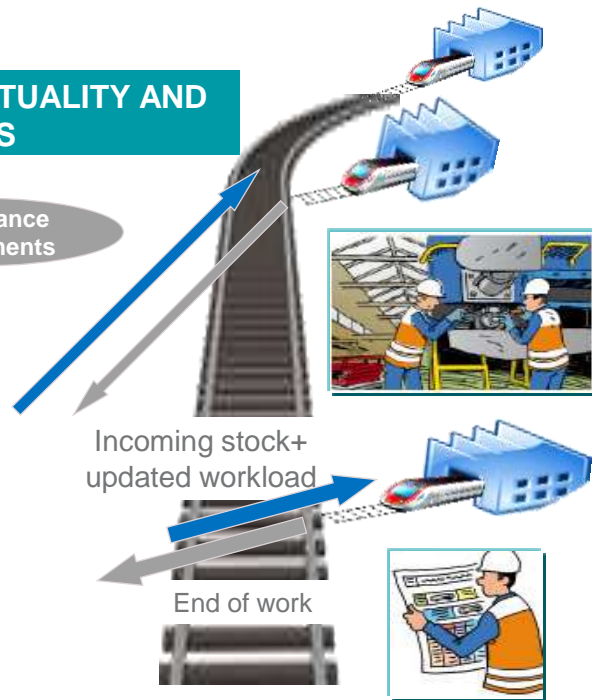
TECHNICAL SUPERVISION OF THE FLEET

- Schedule of maintenance operations
- Distribution of operations among Technicentres
- Monitoring fleet status
- Organising fleet feedback



SITES PERFORMING OPERATIONS

Setting the order of operations for optimum use of resources



- + Plan operations (parts, facilities, HR, etc.)
- + Coordinate production
- + Mastermind industrial excellence
- + Ensure information traceability and sharing

THANK YOU