

# FIAT Research Centre – CRF

Closed-loop PLM for EOL of vehicles

*RFIDs for EOL: presentation of concept*



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**AUTOMOBILES: Fiat, Lancia, AlfaRomeo, Maserati, Ferrari**

**COMMERCIAL VEHICLES: IVECO, IRISBUS**

**AGRICULTURE & CONSTRUCTION: Case New Holland**

**AUTOMOTIVE COMPONENTS**

**METALLURGICAL PRODUCTS**

**PRODUCTION SYSTEMS: COMAU**

**COMPETITIVENESS FOR ALL SECTORS**

**COMMUNICATIONS ENERGY**

**INSURANCE**

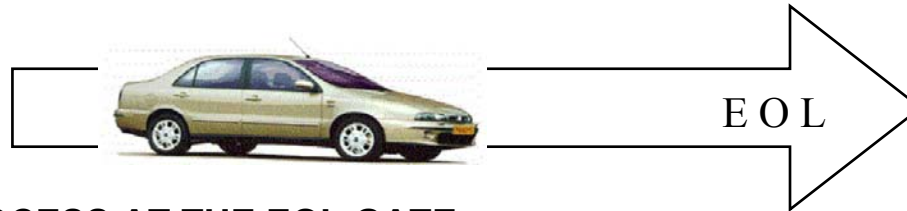
**CRF  
FIAT Research centre**

# Closed-loop PLM for EOL of vehicles - Context



- 10% (estimation) of all hazardous waste generated in Europe originated from End of Life vehicles (ELVs).
- EU laws put pressure on producers to bear responsibility for their final disposal (Directive 2000/53/EC on ELV):
  - Reuse/Recovery/Recycling Targets
- Profitable business in economic downturns
- OEM want to regain spare parts market share from non-original spare parts manufacturers (following the BER – directive no. 1400/2002)
- Objective: an “on-board diary” collecting information about the usage of the vehicle (and its components) and capable to quantify the efficiency of the main vehicle subsystems / component during deregistration.

# Closed-loop PLM for EOL of vehicles – Objectives of *on-board diary*



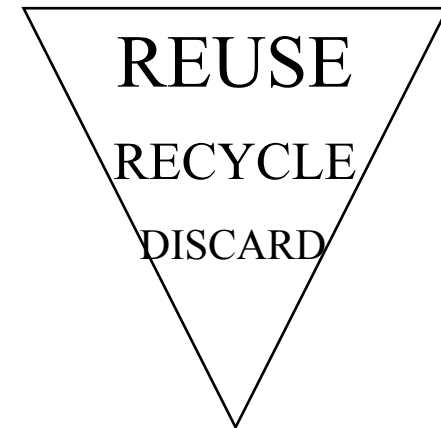
## AS IS SELECTION PROCESS AT THE EOL GATE

- Vehicle history is known only approximately and on a short term memory way
- History and condition of components is not certifiable.
- Selection process is long and based on subjective and time consuming manual inspection
- Default action = discard



## SELECTION PROCESS AT EOL GATE USING ON BOARD DIARY

- Vehicle history is well known from the beginning
- History, age and condition of components is certifiable.
- Selection process is a quick, wireless session based on the automatic acquisition of several mission profile statistics
- Default action = analyse



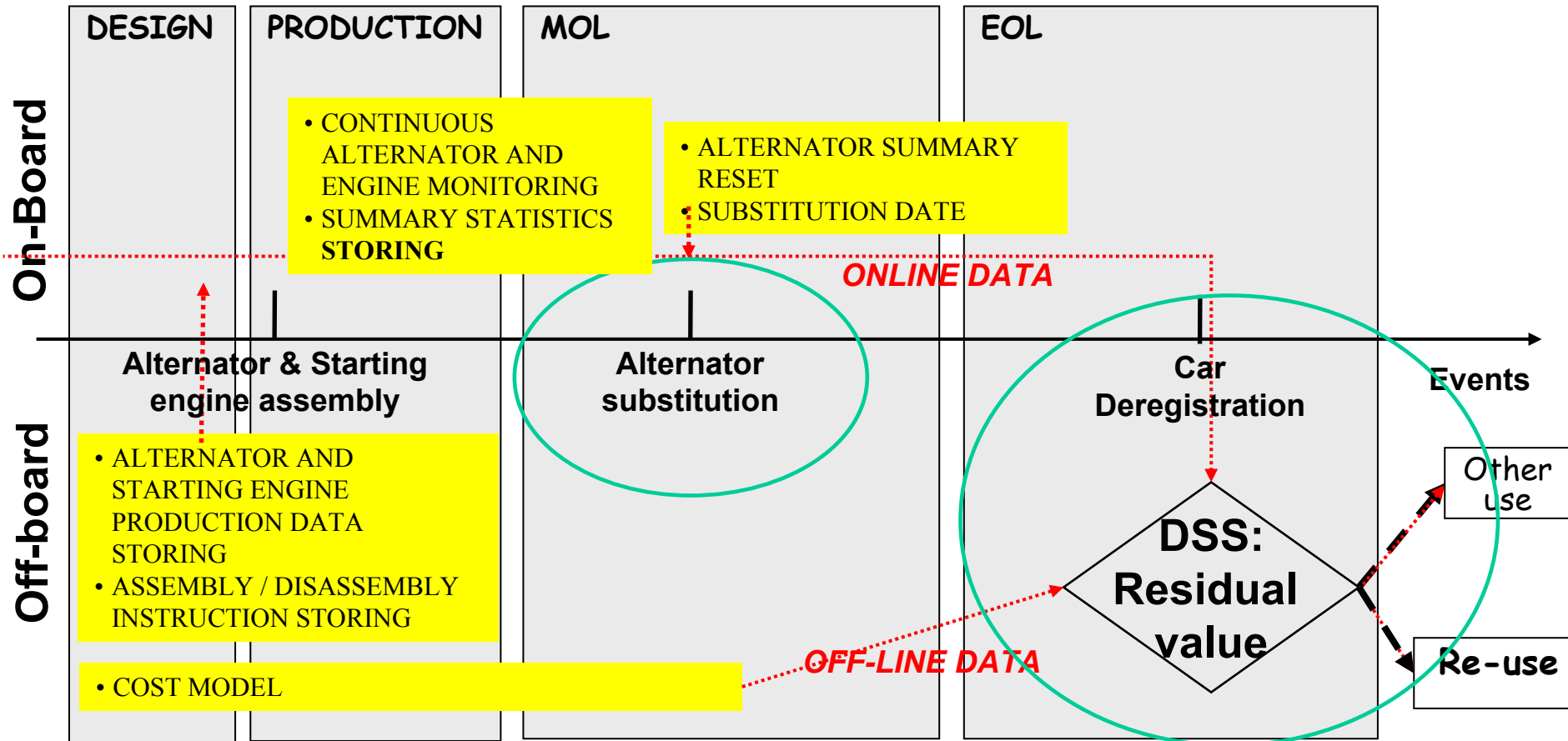
# Closed-loop PLM for EOL of vehicles - Constraints



- Lifespan is huge (up to 20+ years)
- Connectivity is not assured, except at interventions in garage
- Cost must be limited (nr. components x nr. vehicles)
- Strategies for data inconsistencies check
- Memory is limited... information (coming from ECUs) is huge
- Data is sensitive (client habits)
  
- Then... physical constraints
  - Rotating elements
  - Metal, liquids
  - ...

# Closed-loop PLM for EOL of vehicles - Scenario

Example: Data & Info collection on the “On board diary” for a set of components: ALTERNATOR & STARTING ENGINE



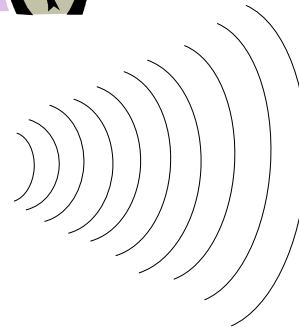
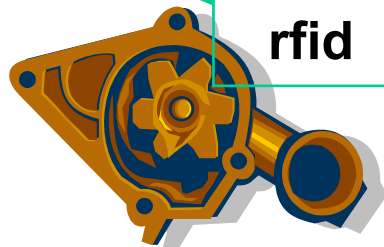
# Closed-loop PLM for EOL of vehicles - Scenario

Event: component (clutch) substitution

Clutch breakdowns



Substitution at garage



**ECU AUTOMATICALLY**  
recognises the substitution has  
been done (modification of SN)

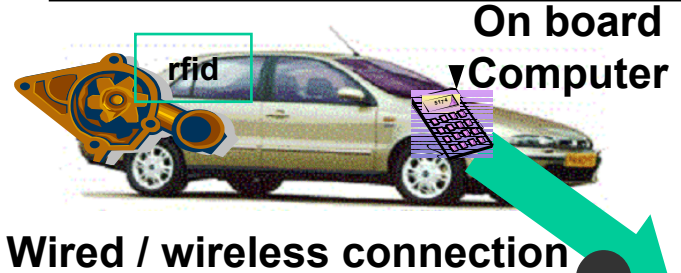
**On Board Diary**  
(inside ECU)

**On board diary**  
**AUTOMATICALLY** updates  
data on Clutch and reset  
summary

# Closed-loop PLM for EOL of vehicles - Scenario



**Event: car deregistration and on-board diary use (FINAL EVENT)**

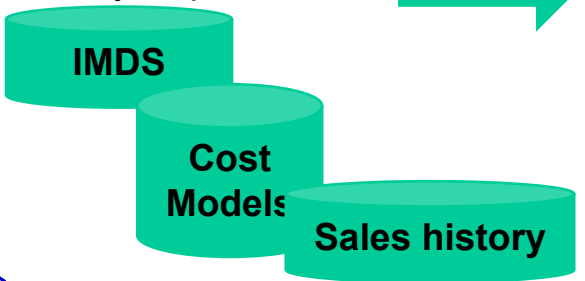


*On board static and dynamic data:*  
 SNs, Mileage, engine revs, age, etc  
 Nr of engine start-up Vs outside temperature,  
 Nr of "cold start", etc.

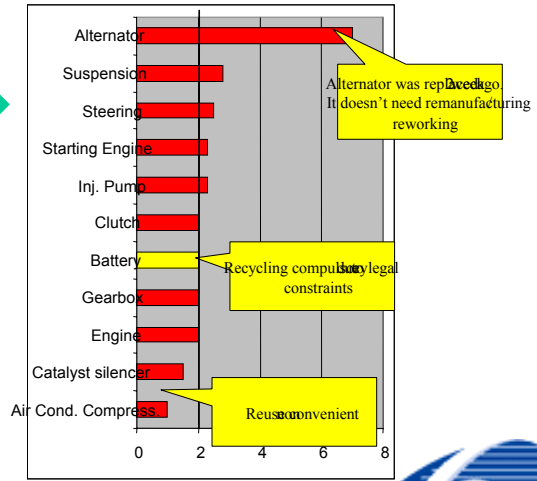


**DSS:  
Residual value**

*Off board static and dynamic data:*  
 Production parameters  
 Recycle procedures

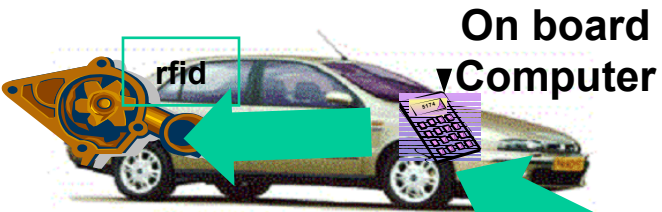


**LIST OF COMPONENT TO BE RECYCLED/ REMANUFACTURED (IN DESCENDING ORDER OF WORTH REUSING SCORE)**





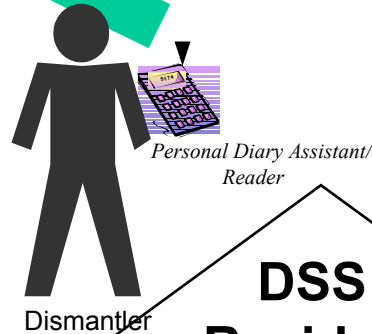
# Closed-loop PLM for EOL of vehicles - Scenario



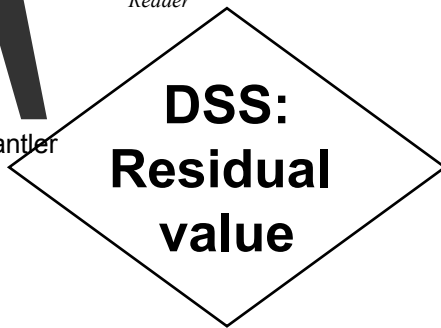
**Event: car deregistration and on-board diary use (FINAL EVENT)**

*Component specific Info (quality level warrantee, list of reworking actions, etc)*

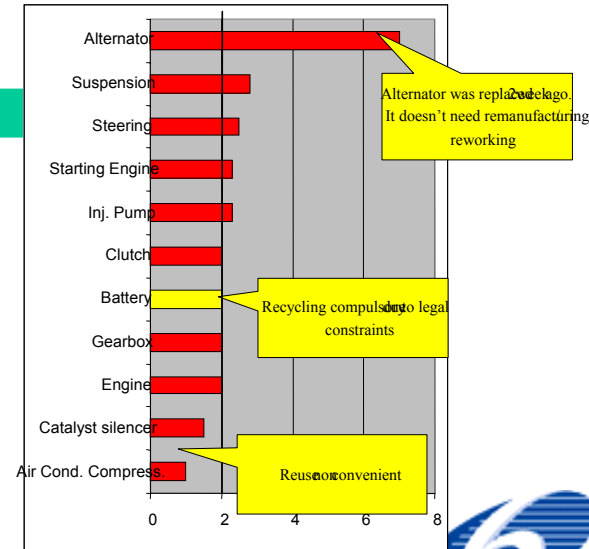
**Component detachment**



*Update spare parts DB*



**LIST OF COMPONENT TO BE RECYCLED/ REMANUFACTURED**  
(IN DESCENDING ORDER OF WORTH REUSING SCORE)



# Closed-loop PLM for EOL of vehicles – *The presentation of concept*



On-going tests... (with  
Cambridge Univ. Auto-Id Lab)  
and DSS demo...



**Promise Demo**

File Settings Help

Vehicle name: Vehicle 1  
 Vehicle id: TEST0413557991976  
 Mileage: 5000

Drive 1000 km...

Read time (sec.)

Read components

Present History

Components read:

Name	Part number	ID

Normal component  
 Component type appearing several times  
 Unknown component type

Missing components:

Name	

Reading...please wait...

**Promise Demo**

File Settings Help

Vehicle name: Vehicle 1  
 Vehicle id: TEST0413557991976  
 Mileage: 5000

Drive 1000 km...

Read time (sec.)

Read components

Present History

Time	Component
21.11.2005 11:05.14	MyClutch
21.11.2005 11:04.08	MyClutch 2
21.11.2005 10:59.31	
21.11.2005 10:55.03	
11.2005 10:52.45	
11.2005 09:27.57	MyClutch 2
11.2005 09:25.29	MyClutch 2
11.2005 15:47.50	MyClutch 2
11.2005 15:44.18	New component
11.2005 13:01.25	MyStarter
11.2005 13:01.03	MyClutch
11.2005 13:00.45	MyClutch
11.2005 13:00.25	MyClutch 2
11.2005 12:59.28	New component
11.2005 12:57.14	MyClutch
11.2005 12:57.09	
11.2005 11:20.44	MyStarter
11.2005 11:20.20	MyClutch 2
11.2005 11:20.00	MyClutch
11.2005 11:15.59	
11.2005 11:13.54	

Ready to read components

**Component information**

Name: MyClutch 2  
 ID: 8  
 Component type: Clutch  
 Component mileage: 5000

Save

Component data    Component information

Name	Value	Persistent
Mydata2	3423423423423	yes
internal-code	12345	yes
myData	232321	yes

Add    Change    Remove

