Optimisation of vehicles' reliability and maintainability

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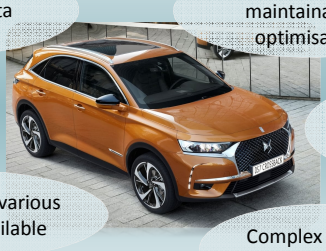
Background



Aims

Optimise PSA vehicles' reliability and maintainability

Design (PSA)	Post-sale (PSA)	Post-sale (Customer)
How could feedback data and data from driving tests help improve components reliability before car's commercialisation?	*How could data from driving test and first customers' data optimise vehicles' maintenance?*	*How could on-board measurement unit give the maintenance needs to the customer?*

Design process of a car

Preliminary studies	Design and development			Vehicles' commercialisation
	Original concept	On-road testing	Vehicle's modification based on the on-road testing	

Vehicle in development — ***Vehicle in circulation***

Methods

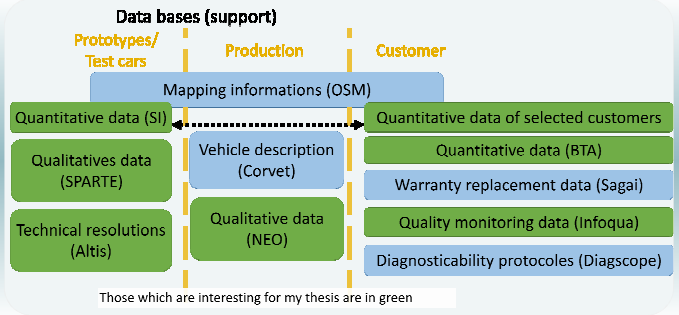
		Issue	Data	Method	Results
1	Selection of the components to take into account	*Which are the less reliable components?* *Which are the most urgent cases?*	BTA and NAVIG data from vehicles in circulation	Statistical treatment	*List of parts to take into account*
2	Identification of components that are reliable or modifiable	*How and when quantify or qualify the indicators for each component?* *How to interpolate between two discrete values?*	Based on other vehicles: - Now : BTA unit - After 2020 : BSRF unit Based on the same car: - SPARTE Database, during validation phase - BTA unit, when customer drives	Group of methods to deal with qualitative and quantitative datas in small or high quantity + Integrate uncertainties	*Performance indicator* *Proposal of a first curve + updated curve* *Time*
3	Elaboration of a maintenance strategy	*When replace which component?* *Which strategy adopt : do nothing, replace one or more parts, plan some replacement?*	Influence of a failure on the other parts Direct and indirect maintenance costs Residual performance	Test and simulation of various maintenance strategies + Sensitivity analysis	Maintenance strategies New maintenance policy Prototype of customer interaction

Results

PSA databases :
- Identification completed
- Links established
- Description completed
- Classification in progress

Data treatment methods :
- Identificationcompleted
- Description in progress
- Comparison in progress

First year objectives :
- Understand databases and treatment methods,
- Select the most adapted « data ↔ method » couples



Conclusion

Databases are known and understood
Data treatment methods are identified, descriptions are in progress

Perspectives

Use the acquired knowledge to develop the methodology of optimisation of vehicles' reliability and maintainability

Bibliographie

Sikorska, J. Z. et al. (2011). *Prognostic modelling options for remaining useful life estimation by industry*. Mechanical Systems and Signal Processing 25, 1803-1836.
Lee, J. et al. (2014). *PHM design for rotary machinery systems—Reviews, methodology and applications*. Mechanical Systems and Signal Processing 42, 314-334