Contract No. 777564

INNOVATIVE RUNNING GEAR SOLUTIONS FOR NEW DEPENDABLE, SUSTAINABLE, INTELLIGENT AND COMFORTABLE RAIL VEHICLES

D1.4 Technology concepts for condition monitoring and their final assessment

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Dissemination Level		
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CO	Confidential, restricted under conditions set out in Model Grant Agreement	X
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

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PUBLISHABLE SUMMARY

This report presents a description of the Technology Concepts of RUN2Rail WP1 and an assessment of their impacts inside and outside the rail sector, including potential impacts on the existing Regulatory and Standardisation (R&S) framework.

The benchmark for the impact assessment is inspired to Metro de Madrid's series 8000 3-piece 55.5 m trainset, in its operation on line 10. Most of the necessary data were available for the project thanks to MDM who are a part of the RUN2Rail consortium.

The impacts are categorised as:

- within the scope of the ROLL2RAIL Universal Cost Model UCM (costs of investment, energy, noise consequences, wheel maintenance, track maintenance, unavailability, hazards); the analysis was referred to metro operator managing both vehicle and infrastructure; modifications and integrations to the UCM were used where needed;
- out of the scope of the UCM: other economic impacts not directly affecting the operator or outside the rail sector, environmental impacts, social impacts, R&S impacts.

The differences with respect to the benchmark scenario were explored for the above impacts over the 30-year time-frame of the study for a scenario in which the benchmark trainsets are replaced by the similar trainset CONC_BG1, which is a conventional bogie-vehicle 3-piece trainset with an innovative standardised-architecture CMS comprising an in-service load CMS and a running-gear defect CMS (wheelset, gearbox, primary suspension).

The methodology consisted in putting together, within the framework of the UCM and the above impact categorisation, the inputs drawn from the RUN2Rail consortium members (mainly EVOLEO, LRS, MDM, POLIMI, VIBRATEC), the RUN2Rail deliverables on Condition Monitoring Systems - [1], [2], [3] - internal documents and desk research for the calculations regarding energy consumption, wheelset maintenance, track degradation, reliability/availability/safety. The results were put together with an approach based on Cost-Benefit Analysis, which is not intended as an accurate CBA but rather a preliminary rough attempt at capturing the knowledge generated within the RUN2Rail project in a "CBA form" targeted to the end-users. Qualitative assessments were performed for the non-UCM impacts and the R&S impacts.

The results show that the RUN2Rail technology concepts are capable of bringing benefits to the operator that justify investments, comprising trainset acquisition and additional required maintenance and other costs, in the order of 5% of the assumed benchmark trainset price of 3.5 to 4 M€. The reader should however consider the premises of the analysis, which is not intended as an accurate CBA but rather a preliminary rough attempt at capturing the knowledge generated within the RUN2Rail project in a "CBA form". Therefore the results should in no way be used as

"go/no-go results" which actually justify or not the adoption of one or the other (or neither) of the concepts.

A key methodological contribution to ROLL2RAIL's Universal Cost Model (UCM) was developed for the quantification of unavailability costs saved by adopting Condition Monitoring Systems on trains. The methodology is also easily applied to the quantification of hazard costs for CMS with safety-related functionalities. The RUN2Rail work stressed the importance of a precise definition of unavailability types and that operators should include in their databases a record that associates an unavailability category (UCM 1 or 2) or even better a cost estimate or range to each recorded sub-assembly failure, in order to support future decisions on the convenience of adopting sub-assembly CMS.

The other economic impacts (non UCM related) are mainly due to a part of the investment going outside the rail sector to suppliers of hardware/software, data processing, qualification/certification (all positive impacts). Minor environmental impacts (positive) are due to fewer trainset movements related with the improved workshop management and slight possible contribution to favourable modal shift. Main social impacts are are on unavailability of trainsets during service (not quantified but probably non-negligible), on job opportunities and slight effects on safety due to favourable modal shift from unsafer transport modes.

Regarding the R&S impacts, it is possible to view both the architecture and the technology concepts described in this and the related RUN2Rail deliverables as a potential direct impact on CONNECTA and PIVOT for consideration in future R&S work. It is not a task for RUN2Rail to make the connection with the Train Control and Monitoring System TCMS, but this can be made in future projects, in PIVOT and in CONNECTA.

The issue of regulatory acceptance of maintenance plans that adapt to measured in-service loads is considered as an important R&S barrier to be addressed if this possibility is to be allowed easily and effectively in the future.