Chapter 18
ETCS Developing and Operation: Italian Experience

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ABSTRACT

ETCS/ERTMS actually is the present for Italian Railways but it will also be the next future for the signalling system in many countries and the best technological choice for ATC (Automatic Train Control) systems. Italian Railways, first in the world, have carried out ETCS Level2 merging the technologies and the regulations respecting the highest safety level. RFI, following the CENELEC 50-126 Lyfe-Cycle, has developed a process for planning, managing, monitoring and controlling of ETCS achievements. In particular the Disposal 29 and 32 in the year 2002 have been issued for the assessment and homologation process of Generic and Specific Applications and other following procedures have permitted the final configuration of the project until its putting in service. The goal of this course is the Preliminary Acceptance of a Generic Application and later; after a successful testing period on field, its Homologation. RFI has followed the developing process starting from the idea to define the specifications, evaluating the hazards and their probabilities, finding mitigations to improve the safety, validating the products of the suppliers, testing the subsystems and the entire system, until the final activation of the whole systems (compliant with the Technical Specifications for interoperability, UNISIG v.2.2.2). Much attention has been paid to the testing of functional scenarios (using also formal languages) and the real tests on the track have been reduced with the support of an ERTMS Laboratory in Rome (unique in the world for its characteristics) where on-board and track-side subsystem permit to reproduce easily and quickly most of the real situations.

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This testing process in ETCS laboratories has been useful not only before the putting the ETCS in service but also for the reconfiguration of the actual ETCS lines as it would be hard to do so many test scenario during a commercial service. These activities have been replicated several times, for example, to reach the actual ETCS version compliant to the UNISIG 2.3.0d. The success of the formal language analysis of Test-Specifications has also encouraged the RFI ETCS group to develop a state-charts model of the functional specification. This work is actually in progress but a first result, on the logical behavior of the system at the transition with a historical signalling system, has been done and validated.

**INTRODUCTION**

Rail transport is a strategic historical sector in the worldwide policy for a sustainable mobility (Obama, 2008) (European Commission, 2010) (European Commission, 2006). In Europe, for instance, one of the main effort for this scope has been the developing of the Trans-European projects for railway interoperability with the aim to avoid the saturation of certain major arteries, and, thus, the related pollution, and to support transport modality with a lower environmental impact, removing, for instance, the bottlenecks in the railway network and supporting the develop of an over-national railway network.

In fact, although most of the rolling stock is technically capable to travel on a wide part of the European rail network, today the same cannot be said of locomotives, which suffer numerous constraints concerning the different electrification and signalling systems (Figure 1 Signalling systems in European countries) at the borders of the national systems (European Commission, 2010).

To overcome this problem, in 2004 the European Commission has issued the Directive 2004/50/EC that defines the conditions to achieve interoperability in order to guarantee the safe and uninterrupted movement of trains crossing two systems without any performance reduction. The directive concerns both the high speed lines and

![Figure 1. Signalling systems in European countries](image-url)
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