

The Feedback Method applied in Agriculture and Construction: critical areas and new perspectives

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Massimo Bartalini, Stefano Boy, Claudio Stanzani, Fabio Strambi.

The machinery directive, DIRECTIVE 2006/42/EC, provides the active participation and the influence of the social partners in the standardization process in all the Member States.

It is evident that the involvement of the recipients of the standards and the users of the machines placed on the European market can contribute to an improvement of both the preparation and the monitoring of the effectiveness of the standards.

Many standards that deal with ergonomic principles, as EN 614-1, Safety of machinery. Ergonomic design principles. Terminology and general principles strongly recommend user involvement because it helps to identify measures and improvements for future design.

CEN Guide 414 (Safety of machinery - Rules for the drafting and presentation of safety standards), EN ISO 6385:2016 (Ergonomic principles in the design of work systems), EN ISO 9241-210:2010 (Ergonomics of human-system interaction— Part 210: Human-centered design for interactive systems) and EN ISO 12100:2010 (Safety of machinery - General principles for design -- Risk assessment and risk reduction), also provide for feedback from the end-users of machinery, and affirm the need to continue monitoring the effect of the system in order to safeguard against long-term deterioration in the performance or health of the users.

In March 2006 ETUI organized a Seminar in Brussels, attended also by representatives of the European Commission, on the results obtained by the application of the Feedback method to collect the contribution of the end users to improve the standards, design and manufacturing of the woodworking machines and of the forklifts.

In December 2006 the Commission wrote the M/396 EN Mandate: "When executing the standardization tasks CEN and Cenelec are requested to take due account of feedback from end users of machinery concerned".

The CEN, therefore, has formalized to the ETUI, with the resolution 318 of 26/9/2008, the request to submit a proposal (developed in close cooperation with CEN/TC114) for a Technical Report based on the Feedback method.

On 17/11/2015 CEN approved the Technical Report, TRR 16710-1: 2015 "Ergonomics methods - Part 1: Feedback method - A method to understand how end users perform their work with machines".

This TR, translated into several languages, is currently included in the catalog of CEN standards and can be acquired by the various European and international Standards Bodies.

The "Feedback Method" is articulated in seven main steps: selection of the machine to be investigated; collection of documentation and preparation of a machine dossier; identification of companies where the machine is regularly used; inspection of workplaces; work groups and work analysis with skilled users of the machine; written report of the FMWG results and their validation. Lastly, the drafting of the final technical report which also contains the summary of the critical issues and the list of suggestions to be submitted to the standardizers, to the designers, the manufacturers, to the labor inspectorate and to the market

surveillance authorities as well as to the employers and the workers (for designing training programs and specific safety procedures for the examined machine.

The studies carried out over the course of 20 years in several member countries have demonstrated the validity of the Feedback method for gathering the creative contribution of the end users in acquiring a deep knowledge of the work as it actually takes place in the different operating conditions with each specific machine; consequently it has been possible also the identification of some suggestions to improve the application of ergonomic principles in the standards, in the design, production and management of the machines.

The knowledge acquired on the critical issues presented by various machines, especially those used in agriculture and in construction, is significant. Important improvement suggestions have also been collected, the effectiveness of which can be monitored and verified over time using the same TR 16710-1: 2015.

Some of the main problems highlighted by the studies conducted in construction and agriculture are referred to:

1) stability problems of self-propelled machines, especially agricultural ones, mainly in presence of terrain with steep slopes and height differences, when the following conditions can occur:

- the driver is not always fully aware of the conditions of the terrain on which the vehicle is moving and of the consequent risks of instability and overturning; hardly ever an inclinometer is present on the dashboard/control panel.
- in case of overturning, some machines are not provided with roll over protection systems, ROPS, and/or with ergonomic, non-avoidable, retaining systems at the driver's seat

2. Visibility from the driver's seat is often problematic, especially when reversing and in the presence of towed equipment.

This may cause both the investment of persons and the falling of the machine in steep slope terrain. It is suggested the installation of proximity sensors or, better, of external video cameras and monitors in the cabin for the vision of the area around the operational zone of the machine.

Problems in maintenance and cleaning are registered, specially for the most complex machines, in presence of the need to reach the less accessible parts and instruments often located at too high levels.

Many are the critical areas highlighted in Agriculture and Construction machines. New studies are planned in these sectors applying the Feedback method:

- to study further machines as Trailed field sprayers in Agriculture and Excavators in Constructions;
- monitoring the highlighted critical aspects of the already studied machines and the effectiveness of the adopted solutions.

Gathering the contribution of the skilled end users of the new technologies - robots, co-bots, artificial intelligence, AI- is the next challenge of the application of the Feedback method for the protection and improvement of the safety, health and well-being in the new human activities.