

## **Spanish's experience on improving inspection of sprayers: official manual for ISO 16122 and ISO 16119**

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### **Summary**

Mandatory inspections in Spain are organized following ISO 16122. In order to guarantee a clear and comprehensive inspection's procedure in all of the official inspection's workshops, the Spanish Ministry of Agriculture published an official inspection's manual based on ISO 16122 in order to improve and harmonize the process.

On the other hand, and considering the more and more cases of new sprayers with difficulties to fulfill the mandatory inspections requirements, an official manual for sprayer's manufacturers have been published in collaboration with the Spanish Association of Agricultural Machinery Manufacturers (ANSEMAT) giving them a practical document to fulfill the requirements established in ISO 16119.

Both documents have been written by the research team of UMA-UPC. In this paper will be presented the objectives, structure and success of the two official manuals.

### **Introduction**

Since the official publication of European Directive for a Sustainable Use of Pesticides (SUD) (EC, 2009a), the inspection of sprayers in use in Europe became mandatory in all EU members. Since that date, the mandatory process was adopted in a different way in all countries, with great differences among them, both in terms of experience, capabilities and resources.

Concerning the technical aspects of the inspection procedure, the requested mandate from the European Commission to the CEN (Committee European of normalization) started a large and intense process in order to produce new harmonized standards to be adopted in all EU members for the inspection of all pesticide application equipment (PAE), in line with the specifications of Annex II of the SUD (EC, 2009).

Before the official publication of SUD, inspection of sprayers in use was already arranged in some countries, either on a voluntary basis or linked to specific national requirements. Technically, the process followed European Standard documents, as EN 13790-1&2. These standards, only available for boom and orchard sprayers (parts 1 and 2 respectively) have been deeply reviewed and finally published as EN ISO 16122 (parts 1,2,3 and 4) (ISO, 2015). This new series of harmonized standards requires technical skills for a complete interpretation and application. That's was the reason why Ministry of Agriculture in Spain started a process to elaborate an official Manual for inspection of sprayers in use, in order to provide to all the official inspector's workshops a practical guide for a fully application of ISO 16122 series. This paper offers a detailed explanation about the

### **Difficulties to follow International Standards on a daily inspection activity**

Official documents establishing the technical procedure for a complete inspection of sprayers in use (EN ISO 16122 series) are not a good example of clear, objective and easy to read documents. These facts lead to a difficulty in the interpretation and application of technical requirements during an inspection process. Especially for those non-frequent standard-readers, by the way the larger number of official inspectors and workshop's directors in Spain. This fact leads into practical problems that can be upgrade into administrative failures, due to absence of objectivity during the inspection process. This feeling is widely disseminated in general among technicians when talking about the official standard documents and its difficulties to be implemented. For all these previous reasons, it was

decided in Spain to develop an official guideline to help the users in the application of the official standards.

### Manual for inspection of sprayers: structure and contents

This tool is mainly focused and dedicated to facilitate the comprehension of the whole procedure for the future inspectors and inspection’s workshop responsible. The manual (Figure 4) has been developed by *Universitat Politècnica de Catalunya* and *Centre de Mecanització Agrària* (Generalitat de Catalunya), and includes detailed explanation (with graphical and pictures support) of every single action to be developed during the inspection procedure. The main objective of this manual is to facilitate all stakeholders involved in the inspection process the detailed knowledge and abilities to manage the international standards officially in use for the purpose (EN ISO 16122-1,2 & 3). The structure of the manual has been established as a guideline during the practical process of the inspections. During the whole document, the information and contents have been structured as indicated in Figure 1. The left part of the book includes specific pictures/graphics concerning the subject explained in the right part. Pictures with “good or bad marks” indicate good or bad thinks on different aspects to be considered. The right part of the book contains, for every specific aspect during the inspection process, the official wording according the EU standards, the established procedure (measurement, checking, control...), some practical recommendations for the inspector and the evaluation process depending on the inspection results. The Manual contains all aspects concerning the inspection of sprayers in use, according EN ISO 16122, for field crop sprayers (part 2) and orchard and bush trees sprayers (part 3). First part of the manual is dedicated to a complete explanation of part 1 of the standard.

This manual has been adopted as the official reference document in the Spanish legislation concerning the mandatory inspection program (BOE, 2011), and it has been distributed during the official inspector’s training courses.

The new version of the manual includes all the changes, new incorporations and new evaluation criteria appeared in the new harmonized standard ISO 16122.

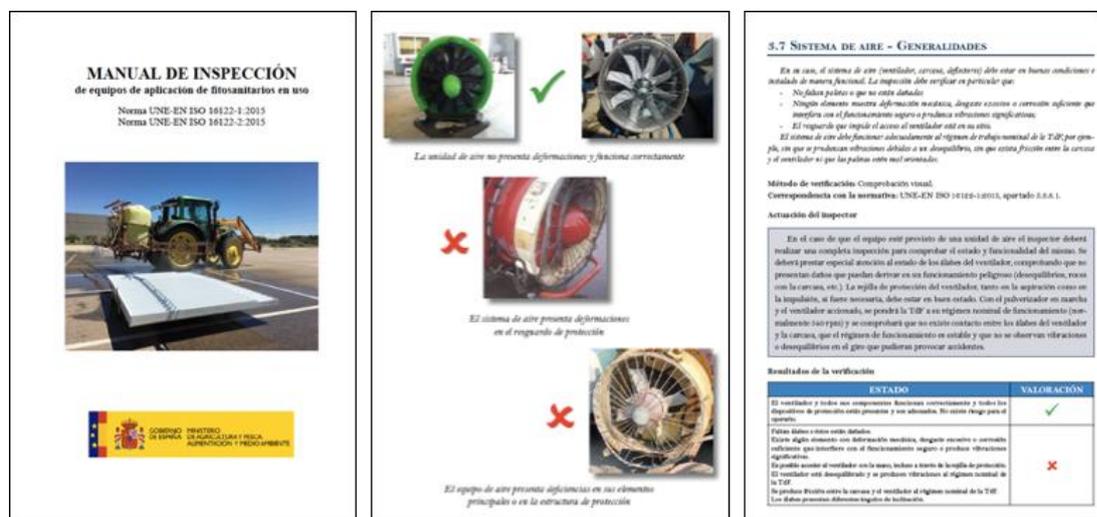


Figure 1. Manual for inspection of sprayers in use. Main page (left) and structure (right). Available at [www.uma.deab.upc.edu](http://www.uma.deab.upc.edu) and [www.magrama.es](http://www.magrama.es) )

### Software for inspections and structure of manual

As it was arranged previously, the Spanish authorities allocated the manual of inspections as the official reference book for the process. Linked to that, it was also adopted as official software the one developed by Universidad de Zaragoza (Gil et al. 2014) (<https://eps.unizar.es/priteaf>) (Fig. 2).

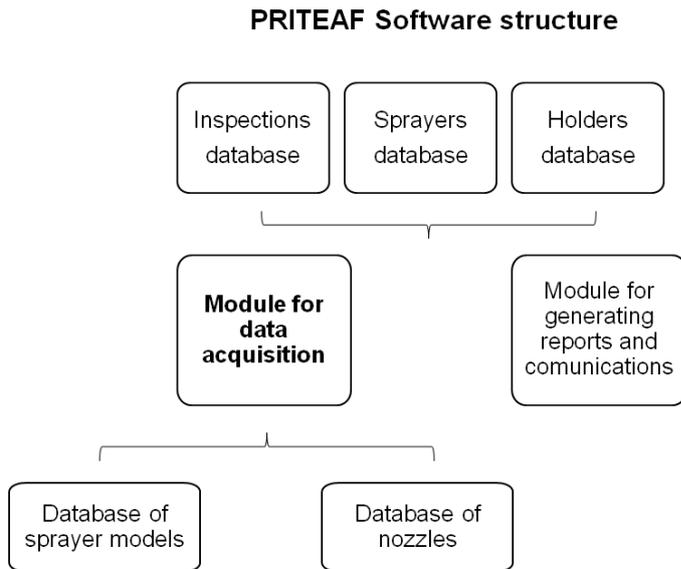


Figure 2. Architectonic structure of PRITEAF software

After the official publication of new harmonized standard ISO 16122, and once the new manual for inspection of sprayers has been updated and officially published as the reference book, also the software has been modified. With the main objective to clarify and simplify the inspection process, the new software has been adapted according the structure of the new manual of inspections.

**Importance of guarantee the quality of new sprayers: Manual for manufactures**

Technical characteristics of the sprayers have an important effect during the inspection process being. Theoretically, a new sprayer should simplify the inspection process by accomplishing the mandatory requirements. However, more often than expected, some difficulties have been observed with new or close to new sprayers, showing difficulties to accomplish the technical requests established in ISO 16122. More often than expected, also, failures in accomplishment of ISO 161109 have been observed.

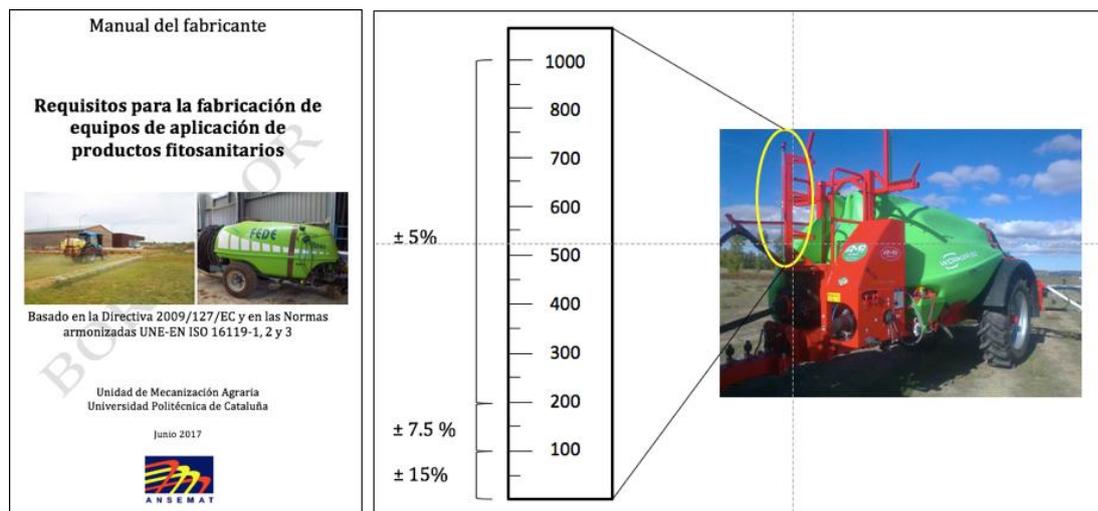


Fig. 3. Practical guideline for the application of ISO 16119 developed by UMA-UPC in collaboration with the Spanish Association of Agricultural Machinery Manufacturers/Dealers (ANSEMAT).

This fact leads to an official arrangement with the Spanish Association of Sprayer’s manufacturers with the main objective to guarantee the complete accomplishment of the official requirement for new sprayers (ISO 16119). This collaboration allowed to demonstrate the difficulties encountered by medium/small manufactures in the total accomplishment of the requirements, in most cases due to the absence of information of need for additional explanation. Also, it has been proved the difficulties of evaluate the sprayers following the ISO 16119-3. The assays were expensive, time-consuming and complex (Gil et al, 2018) A complete application of the standard may require a lot of resources. This can be a serious problem for a large number of European sprayer’s manufacturers bellowing to SME group., with limited resources and facilities. Even more, another not quantified difficulty is related with the lack of knowledge of most of those medium/small sprayer’s manufactures, with important difficulties to understand all the established requirements. It is important to improve the communication and feedback from national representative on International Standardization Bodies and local manufacturers, in order to guarantee a clear and useful information channel. In this sense, as a requirement of the Spanish Association of Agricultural Machinery Manufacturers (ANSEMAT), UMA-UPC has developed a practical guideline (Fig. 3) with clear and practical information including real examples, in order to help the Spanish sprayer’s manufactures in the complex process of the accomplishment of ISO 16119 series. This practical guide includes, in more than 80 pages, a complete description of all the requirements and tests procedures to guarantee a complete accomplishment of ISO 16119. This guideline (Fig. 4) has been written with the main objective to help sprayer’s manufacturers in the accomplishment of the mandatory requirements derived from the European Machine Directive (EC, 2009b).

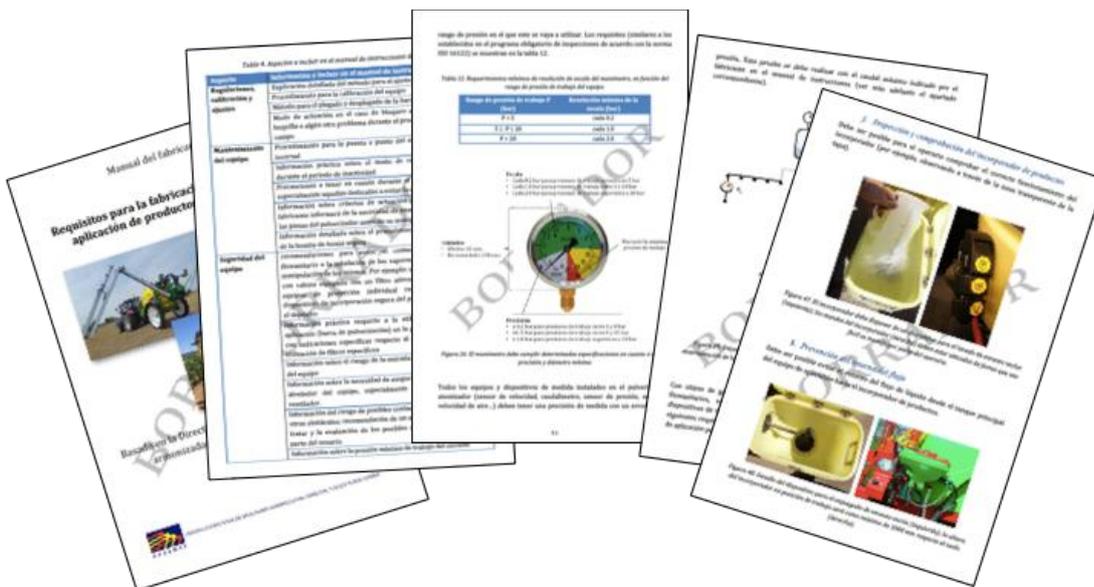


Figure 4. Technical guideline (87 pages) with detailed explanation about test methods, material, procedure and evaluation results following ISO 16119 (1,2&3)

## Conclusions

The Spanish experience has widely demonstrated the interest for a good guideline as support for the fully accomplishment of the official international standards. Due to different reasons, unfortunately in some cases, ISO 16122 result unclear and tricky interpretable, resulting on a difference criterion of interpretations. For that reasons, the implementation and official publication of a manual for inspections resulted clearly well appreciated by all the official inspection’s workshops in Spain. For all those technicians not very well experienced with the international standards, the manual of inspections represents a clear and useful tool.

Concerning the difficulties to apply the ISO 16119 specially in the case of small and medium size manufacturers, it has been clearly detected deriving in an unintentional non accomplishment of the technical requirements.

It is important to improve the communication and feedback from national representative on International Standardization Bodies and local manufacturers, in order to guarantee a clear and useful information channel. In this sense, as a requirement of the Spanish Association of Agricultural Machinery Manufacturers (ANSEMAT), UMA-UPC has developed a practical guideline with clear and practical information including real examples, in order to help the Spanish sprayer's manufactures in the complex process of the accomplishment of ISO 16119 series.

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