

French market surveillance of CE-marked explosives and pyrotechnic articles

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1. Introduction

The Directive 2013/29/EU for conformity assessment procedures of all pyrotechnic articles [1] and the Directive 2014/28/EU for explosives for civil uses [2], require each Member State to carry out Union Market Surveillance and control of pyrotechnic articles and civilian explosives entering the Union market (Article 39 of Directive 2013/29/EU and Article 41 of Directive 2014/28/EU).

Accidental Risks Division of INERIS has a testing laboratory accredited by COFRAC (French Accreditation Body) according to the ISO/IEC 17025 standard for the testing of explosives, pyrotechnic articles and fireworks for both these Directives. In the context of French market surveillance of CE-marked explosives and pyrotechnic articles and in relation to its long-term experience in testing these products, INERIS, has been charged by the French Ministry of Ecological and Solidarity Transition (MTES) of the evaluation of these products since 2006.

In this paper, we will give some information about the procedures used by INERIS in the framework of French market surveillance (identification of articles from internet sites, validation of selected articles by French administration, purchase and collection directly in public shops, reception, identification/registration and storage in magazines dedicated for fireworks and explosives located on INERIS site at Verneuil-en-Halatte). Sometimes, inspectors of French Ministry can also collect pyrotechnic articles in warehouses and manufacturing sites during their regular inspections and send them to INERIS for control.

Financed by French administration, approximately, 100 pyrotechnic articles per year are subject to conformity assessment in this context. After description of INERIS testing facilities, some general features from recent years (2013-2018) will be discussed in this paper in terms of tested pyrotechnic articles and explosives and relating identified minor, major and critical non-conformities associated to labeling, conception and functioning requirements. An annual report is provided by INERIS to French Ministry that alerts on product non-conformities with French importers and notified bodies responsible for the putting on the market of these articles.

2. The French process of market surveillance

Market surveillance process is subject to a call for tender published by the French Ministry of Ecological and Solidarity Transition (MTES). INERIS has responded to this call for tenders and has been retained as beneficiary of the related contract. Therefore, INERIS is currently in charge of monitoring the French market.

Historically INERIS performs tests for market surveillance on behalf of MTES for explosives (since 2006) and for fireworks (since 2007).

The purpose of this contract is to ensure the conformity of the products concerned by the requirements of the applicable European Directives (and associated standards) and to withdraw or prohibit products which are likely to compromise the health, the safety of the users or which do not conform for some reasons to the applicable requirements.

To this end, an annual program of evaluation is made by MTES with the objective to perform the evaluation of at least:

- 5 explosives for civilian use;
- 90 fireworks: F1 to F4 (certified fireworks);
- 5 pyrotechnic articles other than fireworks: P1, P2, T1, T2.

Note: Please refer to Directive 2013/29/EU and the technical standards for the categories of pyrotechnic articles.

The monitoring of the market surveillance for pyrotechnic articles and explosives is described below:

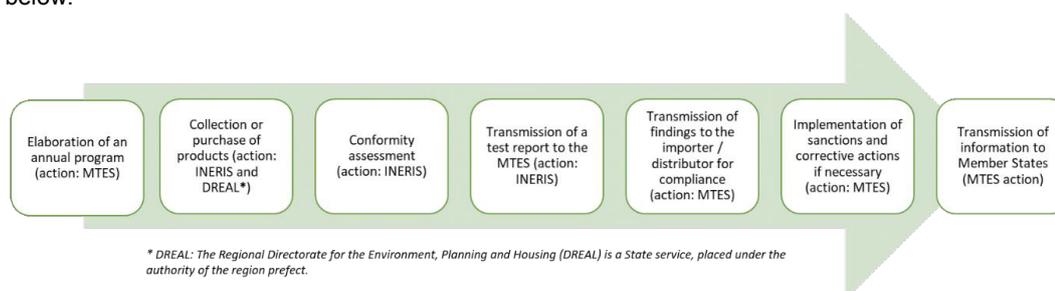


Figure 1: Different stages in processing the French market surveillance

A list of products (identified for example from internet sites) is proposed by INERIS to MTES. After validation of the list by the French competent authority, samples of products selected for control are organized on the current year. Different sample supply schemes are operated on the market according to target type of products:

- Direct purchase of fireworks and other pyrotechnical items from commercial stores.
- On-line purchase of fireworks and/or other pyrotechnical articles and sometimes civilian explosives on the internet, mainly on French sites.
- Direct sampling of explosives from manufacturing sites, possibly in MEMU (Mobile Explosives Manufacturing Unit).
- Sampling of pyrotechnic products directly from French suppliers or manufacturers operated by DREAL inspectorate team members (in 2018).

Considering fireworks, 15 items of articles are collected or purchased (10 are tested for functioning, 1 is used for sizing control, label requirements and is disassembled to evaluate the weight of pyrotechnic composition and 4 are kept during 2 years in case of litigation issues for example). Following the purchase or the reception, articles are briefly visually inspected and counted for identification according to INERIS's references. Fireworks and pyrotechnic articles are handled, kept and stored at INERIS as explosives. In accordance with the rules imposed by storage regulation in France, storage takes place in magazines exclusively dedicated for fireworks and explosives located at INERIS.

INERIS checks the conformity of products following the different standards applicable and referred to the context of CE-market surveillance:

- NF EN 15947: fireworks of categories F1 to F3;

- NF EN 16261: fireworks of category F4;
- NF EN 16256: pyrotechnic articles for theater T1 and T2;
- NF EN 16263: other pyrotechnic articles P1 and P2;
- NF EN 13631: explosives for civil use.

Compliance with the mentioned standards is evaluated according to two axes:

Documentary checks:

- Verification of the documentation required for regulation: EU declaration of conformity attestation
- Verification of compliance of labeling and packaging

Controls on product characteristics:

- Verification of the product design (size, mass ...)
- Verification of functioning (ignition, sound level, projections, incandescent materials ...)

These verifications are reported in an evaluation report transmitted by INERIS to MTES indicating detailed non-conformities (NC) ranked in three categories, namely, in decreasing level of concern order:

- Critical NC: NC which, according to judgment or experience, is likely to lead to dangerous situations or lack of security;
- Major NC: NC which, without being critical, may cause a failure or significantly reduce the likelihood of use of the product or increase the potential hazard;
- Minor NC: NC that will not likely reduce the possibilities of using the device.

Based on the control report issued, the MTES implements, if necessary, sanctions or corrective actions to the concerned distributors or importers. Reporting is also made to all Member States competent authorities.

3. INERIS testing facilities

INERIS has a competent and highly experienced staff able to carry out all kinds of testing on fireworks, pyrotechnic articles and more generally on explosives. Indeed, INERIS dedicated testing laboratory of these products is frequently involved in inter-laboratories tests and is accredited according to EN 17025 standard that guarantees the competence of operators and the quality of results. That includes testing in the frame of certification according to EC directives (2013/29/EU and 2014/28/EU), market surveillance and transport classification.

As regarding safety of fireworks, pyrotechnic articles and explosives, INERIS laboratories and testing facilities are located within its main operating site at Verneuil-en-Halatte (Oise, 60550), in the *Hauts-de-France* Region (at about 60km north from Paris). INERIS explosives testing area encompasses two pyrotechnic polygons allowing large scale testing on explosives and pyrotechnic articles. For large fireworks and usually for category 4 fireworks, INERIS uses a remote opened field located within 1-hour drive from Verneuil-en-Halatte.

As can be seen in Figure 2, to control fireworks, INERIS has a large concrete slab of 30 meters in diameter to perform functioning tests and evaluate projections, functional altitude of small fireworks, fall, acoustic level...



Figure 2: Outdoor facility to control fireworks

Considering explosives, INERIS checks essential safety requirements in comparison to the technical specifications indicated by manufacturers such as (depending on the explosives tested): chemical composition, sensitiveness to impact and friction, resistance of the explosive against influence of water, thermal stability at high temperature, functioning of the explosive when used for its intended purpose...INERIS can also measure detonation velocity in its 50 m³ blast chamber or directly on end user-sites.



Figure 3: Some apparatus to test explosive properties a) sensitiveness to friction; b) sensitiveness to impact c) blast chamber of 50 m³

4. General results of the French market surveillance

In this part, we comment on general trends about the evolution of examined products and their non-conformities all over the period of reference 2013 to 2018 in the context of French market surveillance of CE-marked explosives and pyrotechnic articles.

4.1 Distribution of sampling of fireworks in the last years (2013-2018)

As indicated in Figure 4 below, it is important to note that 55% of the certificate holders of fireworks bought in the French market are Chinese companies and 34% are European companies (10% are French companies).

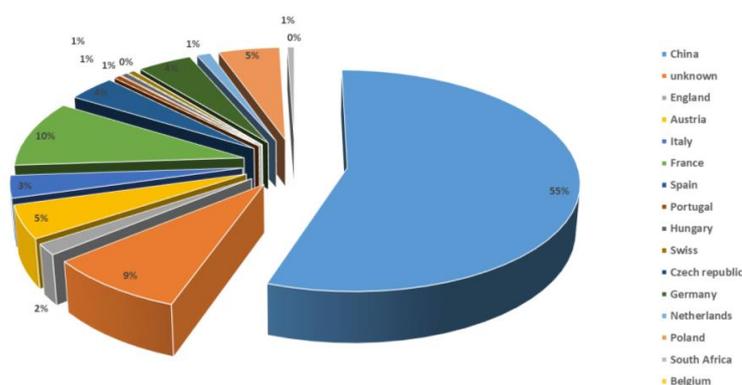


Figure 4: Distribution of firework samples/purchases classified according to certificate holders in the last three years (2016 - 2018)

Besides, the table below summarizes the number of fireworks by types tested since 2013:

Table 1: Collection/Purchased products by type of fireworks over the last 6 years (including only certified products)

CERTIFIED PRODUCTS	Number of products				
	2018	2017	2016	2014	2013
Batterie	9	3	20	13	13
Shell	2	1	1	1	
Roman candle	5	2	1	1	2
Shot tube	1	3	3	1	
sparkler	5		1	1	1
Flash pellet	2		2		
Combination	2		1		1
Crackling granule	7	1			1
Compound Firework	1		1		1
Fountain	10	1	9	1	3
Rocket	7	3	13	1	6
Banger	2	2	6		3
Flash banger		2	7	9	5
Mine			1		
Spinner	1				1
Party Popper	1				
Table bomb	1				
Throwdown	1				
Snap	1				
Ground spinner	3				
Total	61	18	67	28	37

In 2018, 61 fireworks (F1 to F4) were evaluated. In particular, purchases were oriented to fireworks intended for the general public (92% of fireworks tested). Only 5 out of 61 fireworks were category F4 only accessible to professionals. The main types of tested fireworks are batteries, fountains and rockets.

4.2 Global results of French market-surveillance since 2013

Given the results of surveillance of the French market in recent years, there is a very low compliance rate of controlled products considering all types of products (fireworks, pyrotechnic articles and explosives). Indeed, the rate per year rarely exceeds 25% of compliance as observed in Figure 5.

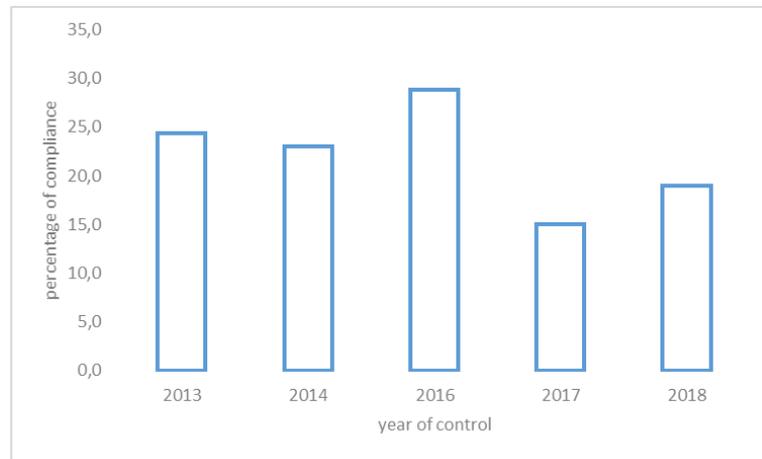


Figure 5: Evolution of the percentage of compliance per year for fireworks, other pyrotechnic articles and explosives

Although the number of critical non-conformities tends to decrease, the number of major and minor nonconformities (all products concerned) remains very high (see Figure 6), especially for the category of fireworks.

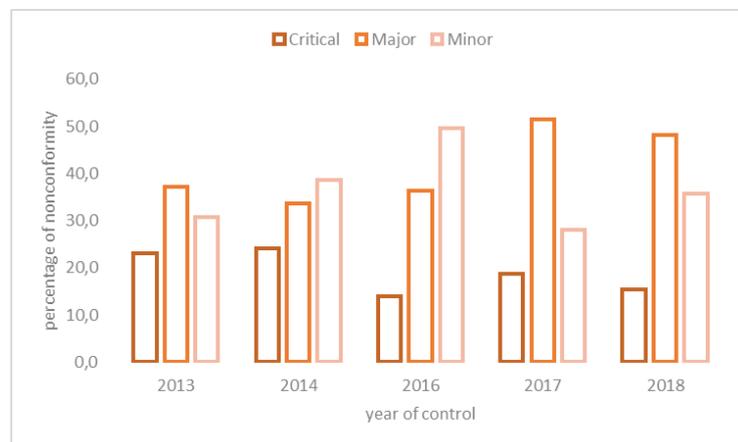


Figure 6: Evolution of the percentage of non-compliance by level of criticality (all products concerned)

The analysis of non-conformities (see Figure 7) according to their origin indicates three major categories of deviation likely to be encountered during controls: labeling, design and operating. Among the non-conformities concerning design deviations, most of them have deviations related to the gross mass, the design of product (material used, holes in primary pack, tube angle, ...) and the poor protection of the ignition device. For non-conformities related to operating problems, we noticed discrepancies related to the unsafe functioning of the product for the operators or the public such as projections of debris or incandescent materials, observation of ignition phase times out of tolerance and exceeding tolerable sound pressure levels. The majority of the discrepancies noted relates to inappropriate labeling, which are therefore from a technical point of view easier to correct (in comparison with design and operating deviations). As a result, despite the large number of non-compliant products detected, the importer can easily make technical adjustments to solve labeling deviations implying that the procedures for final withdrawal from the French market remain limited to a few cases.

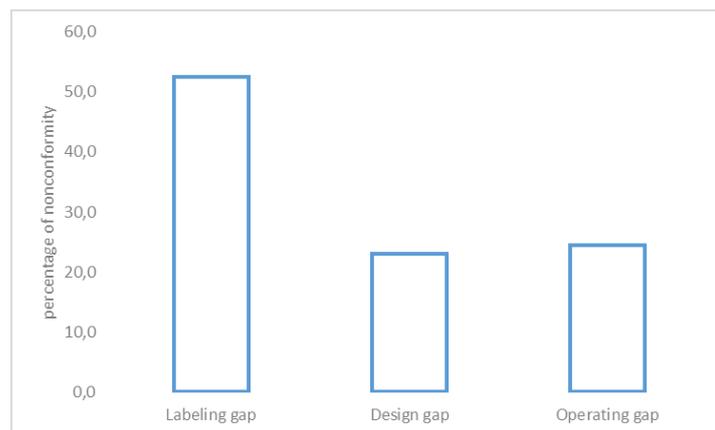


Figure 7: Distribution of non-conformities (2013-2018)

5. Conclusion

INERIS, has been charged by the French Ministry of Ecological and Solidarity Transition, of the evaluation of CE-marked explosives and pyrotechnic articles for a couple of years due to its great experience and availability of large-scale facilities (COFRAC accredited) to test these products. The analysis of observed non-conformities since 2013 indicates that only 25% of products comply with mandatory requirements for their use on the European market. This statement is based on conformity assessment on a six years period to standards used in the context of CE-market surveillance. Even if the majority of non-conformities is related to labeling deviations, the large number of them related to operating of products remains worrying because they have a direct impact on the safety of users. As a consequence of the poor quality of the products placed on the French market from a couple of years (the very stringent requirements for market surveillance criteria may also have influenced the decision), the French competent authority has reinforced the control procedure: by increasing the number of evaluated products but also by collecting a maximum number of product types presenting the greatest risks for public end-users, such as projected fireworks (battery types, rockets, candles ...) as well as devices heavily loaded with active material. In 2018, the collection of samples by the DREAL inspectorate directly from French suppliers has also made it possible to obtain sampling that is more representative of the market and therefore to target products that may pose risks for the end user.

References

- [1] Directive 2013/29/EU of the European Parliament and of the Council of 12 June 2013 on the harmonisation of the laws of the Member States relating to the making available on the market of pyrotechnic articles (recast). OJ L 178, 28 June 2013.
- [2] Directive 2014/28/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market and supervision of explosives for civil uses (recast). OJ L 96, 29 March 2014.