



NEW METHODOLOGIES FOR EFFECTIVE MARKET SURVEILLANCE OF LARGE FANS WITH THE INTAS PROJECT

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SUMMARY

The goal of the INTAS project is to provide technical and cooperative support, as well as capacity building activities, to Market Surveillance Authorities (MSAs) regarding large fans that are subject to energy performance requirements under the Ecodesign Directive. In a first stage, INTAS has analyzed the existing testing avenues in Europe and beyond, and explored test standards, facilities, procedures and methods already in place for large fans. Now, it is in the phase of defining an effective compliance framework for MSAs and manufacturers and will also conduct real evaluation and testing exercises. This paper presents the results achieved so far including the methodologies that are under consideration.

INTRODUCTION

The INTAS project, acronym for *Industrial and Tertiary Product Testing and Application of Standards*, funded by the EU's Horizon 2020 programme, has started in March 2016 to address the need to support European Market Surveillances Authorities (MSAs) deliver compliance with Ecodesign requirements for large industrial products, specifically fans and transformers.

As a significant contribution to support the goals of the EU energy efficiency targets in 2020, the Ecodesign Directive [1] alone should provide yearly savings of up to 600 TWh of electricity and 600 TWh of heat. To achieve these targets, the Ecodesign Directive has moved its focus also into very large products, including industrial fans as covered by Ecodesign Regulation (EU) No. 327/2011, [2].

Total electricity consumption of fans driven by motors with an electric input power between 125 W and 500 kW is 344 TWh per year, rising to 560 TWh in 2020. The cost-efficient improvement potential through design is about 34 TWh per year in 2020 [2], with a projected loss of (aggregate

of the 10-20 % expected loss through non-compliance [3], [4] et al) of 3.4-6.8 TWh. Effective market surveillance hence can help to reduce significantly these potential losses through poor compliance.

The INTAS project is focusing on large fans with input power above 10 kW and uses the term ‘Large fan’ for fans in the range 10-100 kW and the term ‘Very large fan’ for fans in the range 100-500 kW’

The methodologies developed throughout the INTAS project would also lay the foundations and look for synergies for appropriate monitoring, verification and enforcement of other large industrial products, like air ventilation units, water pumps, commercial refrigeration, furnaces and ovens, etc.

THE INTAS PROJECT

The need for the INTAS project arises from the difficulty that MSAs have faced in establishing and verifying compliance with Eco-design requirements for large industrial products.

This project aims to identify and address these issues and providing technical and cooperative support, as well as capacity building activities, to MSAs in charge of enforcing Ecodesign regulations.

Specifically, our objectives are:

- to support European Member State MSAs to deliver Ecodesign compliance for transformers and large fans;
- to support industry to fully understand their obligations under the Ecodesign Directive and to deliver compliance in a manner that will be broadly accepted by MSAs;
- to foster a common European approach to the delivery and verification of compliance for these products.

The project will conclude in February 2019 and involves 16 European partners, among which 11 are national MSAs or cooperating organisations and the remainder are technical partners.

The INTAS project intends to go far beyond simple replication of testing and will fill the current gap in knowledge and capacity of monitoring and verifying large and industrial products. It does assess not only the most efficient method of testing, but also identify issues in sourcing and identifying very large products, improve knowledge and relations between Member State authorities and industry, and help make future legislation on industrial products much better suited for their purpose. The theoretical compliance assessment methodologies that the project will identify in its early stages will also be tested in practice.

Throughout the entire project, INTAS will foster market surveillance collaboration between MSAs and raise awareness and information exchange of the product energy performance and market surveillance among key stakeholders.

INVOLVEMENT OF NATIONAL AND EU STAKEHOLDERS

In order to fulfil the purpose of addressing the challenges faced by MSAs with regards to verification, it is important that current practices are examined, and also that the views and input of the relevant actors are studied. For that reason, the project has used different sources and established groups to organise, collect and address this information.

The project has adopted a national (and European) focal-point approach where 10 national project partners are acting as ‘national focal points’ for the different stakeholders (manufacturers, trade associations, retailers, importers, consumer and environmental organisations, and relevant national

government departments) within their own country and 1 project partner acts as the ‘European focal point’. This national (and European) focal point approach allows for a detailed, two-way communication in local languages, the consideration of regional issues and a wider dissemination of the project development and outcomes. While the 1st National Focal Point meetings have been organised in DK, IT, ES, RO, PT, AT, CZ, FI and PO, a 2nd set of national meetings is expected in spring 2018 when the INTAS methodology is expected to be well advanced.

Furthermore, an Advisory Board to the project has been established which includes 12 experts representing all key stakeholders addressed by the INTAS project, and is detailed in Table 1, and who are kept informed of the project developments and provide feedback for instance, on the definition of the existing market surveillance framework and initial plans for testing activities.

Table 1: Members of the INTAS Advisory Board as of November 2017

Stakeholder group	Organisation
MSA – DE	BAM
MSA – DE	MUKE BW
MSA – CZ	SEI
MSA – DK	DEA
MSA – SE	SEA
MSA – NO	NVE
Industry Association – Transformers	T&D Europe
Industry Association – Fans	EVIA
Policy maker	EC DG GROW
Policy maker	EC DG ENER
Standardisation – Fans	ISO fans
Transmission System operators	ENTSO-E

Events and conferences also constitute another source of information on current situation and business and market surveillance practices.

MARKET SURVEILLANCE PRACTICES AND CHALLENGES

Initially, the consortium developed an internal report on the worldwide and EU current practices in market surveillance to collect information and build a firm understanding of the monitoring, verification and enforcement techniques used in major economies for large fans, along with private schemes and alternative approaches. All collected methods were examined to identify the most interesting elements to be considered as suggestions and advices for the market surveillance procedure to be developed within the INTAS project for the EU Ecodesign.

In all the countries analyzed in the literature review the difficulties of the compliance verification for large industrial products are well known and there is also a clear lack of a unique and validated solution. Monitoring, verification and enforcement techniques are indeed applicable in all the countries that were investigated, but no information is available on their actual application or on the results achieved. Some checks on Ecodesign information requirements take place in EU Member States, however, only a few (<5) Member States have been actively conducting verification testing so far and only for smaller fans.

In this respect, at the national focal point meetings, stakeholders were asked about their main concerns regarding the ability of national authorities to perform market surveillance and/or testing large products. The preliminary analysis of the answers highlights the following issues:

- **Workload/resources:** lack of financial resources, lack of human resources, unavailability of products, unavailability of laboratories/measurement equipment, etc.;
- **Specificities of the products:** great diversity of customised large fans, to ensure that every product segments are verified, market surveillance methodology adapted to the different types of products, etc.;
- **Capabilities:** training is needed in terms to improve MSAs/inspectors and personnel's knowledge;
- **Lack of cooperation:** within MSAs at different level, manufacturer-end user;
- **Logistics:** supply chain and project delivery dates, etc.;
- **Need for clear and simplified procedures.**

A German authority presented and shared its experience on market surveillance of fans in the area of the Ecodesign Directive at a workshop in May 2017 that was organized by the European Ventilation Industry Association (EVIA), [5]. The presentation underlined the specificities with complex integrated products such as fans, where complex technical specifications and test requirements are in place. In addition, observations were shared on the B2B-market spectrum that varies significantly from one product to another, which require specific MSA market insight for a specific product. Other experiences shared included recommendations to MSAs on preparing check activities for large products thoroughly and on the focus of non-conformity issues such as missing awareness of responsibilities as manufacturer, missing complete address on product/package and missing product information.

EVIA has also considered how to address the challenges of market surveillance of large fans and have presented their vision of a seven-tiered approach to market surveillance at more events [5], [6], see Figure 1. The approach starts with a simple review of the product label/name plate of the fan (first tier) and then step-by-step increases the analyses through to a full independent measurement by third party (seventh tier). The approach introduces 'Plausibility checks' (third tier) which are design or application characteristics that can be inspected in-situ to determine if further analysis would be needed.

1. Review of the product label
2. An audit of the manufacturer's ecodesign documentation
3. A plausibility check
4. An audit of the manufacturer's design, measurement and production management system
5. A review of the product testing documentation and type testing results
6. A physical verification by witness testing at the manufacturer's facility
7. Purchase a product and third party assess

Figure 1 Seven-tiered approach to market surveillance proposed by EVIA.

COMMERCIAL TESTING AND DOCUMENTATION

In the current market situation, the energy performance assessment of fans is predominantly relying on the self-declaration and data provided by the manufacturers themselves.

Hence importers/distributors and purchasers (both OEMs using fans to integrate into their own products and systems, as well as larger industrial end-users buying a stand-alone fan for their final purposes) need to trust that they are receiving correct data documentation from their established manufacturers and the trustworthiness of their commercial relationship.

During our screening of existing testing avenues, INTAS identified only a few (<15) independent laboratories capable to perform tests on large fans. Usually, independent laboratories are accredited by internationally recognized accreditation bodies (ILAC members), which provide evidence of capability, experience, quality and good practices of the laboratories for the accredited tests and activities according the international standard ISO/EN 17025. Testing capacity range of independent laboratories are in general lower compared to major manufacturers' laboratories mainly due to economic constraints and limited market demand.

As part of normal commercial practice, manufacturers issue product labels, datasheets and technical catalogues for each product type, including relevant performance parameters like airflow and pressure, motor data and power consumption. The individual fan performance curves and detailed calculation sheets are based on their proprietary software calculation tools.

Representative samples of each fan type/family may be tested on manufacturers test rigs, and in those cases a test report is edited and available. The European manufacturer's test facilities are usually not accredited by national accreditation bodies or against standards of the America-based, Air Movement and Control Association (AMCA).

Test performance for variations of a similar fan design are thus extrapolated/calculated based on the manufacturers real test data from the sample fan and their software tools.

In rare cases, the customer assists during the manufacturer tests as 'witness', or sends a commissioned expert on their behalf. Witness testing seems more prevalent in case of large fans in the upper range (50 kW and above) and purely customized fans for heavy industrial applications where the capital investment per unit represents a significant amount.

Depending on the fan size and conditions, either of the following are conducted:

- Testing of the fan to be purchased by the customer under full load condition (including full range testing);
- Testing of a scaled-down model of the fan which is to be purchased by the customer.

STANDARDS AND CODE OF PRACTICE

Comprehensive international standards are in place for most test situations including laboratory testing [7] and in situ testing [8]. Furthermore, standards clarifying the technical aspects of fan performance for use in contracts made between supplier and purchaser are available, including the aspects of the performance test arrangements, tolerances on data, conversion rules, scaling procedures and documentation [9]. A German code of practice on acceptance and performance testing is detailing and supporting these aspects [10].

With Ecodesign requirements in place, the performance of fans is no longer just a private contractual matter between the supplier and purchaser. The supplier must also establish technical documentation on their product's compliance before they are placed on the market and this documentation is subject to market surveillance checks. To support this, the European Commission has given a mandate to CEN to prepare a harmonized European standard that will include among

other subjects the identification of the fan types, measurement categories, test methods and very importantly, the definition of the fan boundaries (what elements are included in the fan sample to be tested) [11]. The proposed methods under consideration to do this include the application of scale rules and testing at modified speed for large fans. Until the harmonized European standard is published useful supporting information can be found in the FAQ accompanying the fan regulation [12].

TOWARDS A COMMON APPROACH

One of the main objectives of the INTAS project is to foster a common European approach to the delivery and verification of compliance for large fans. It is not the role of the INTAS project to evaluate the risk of non-compliance dependent on the size of the fans – this we leave to the individual Market Surveillance Authority. Based on the stakeholder inputs and the investigations made so far, we aim to propose approaches that on the one hand support the overall obligations market surveillance authorities are working under today, and on the other hand to propose methodologies that adapt elements of commercial practices even if they are not fully in line with today's obligations.

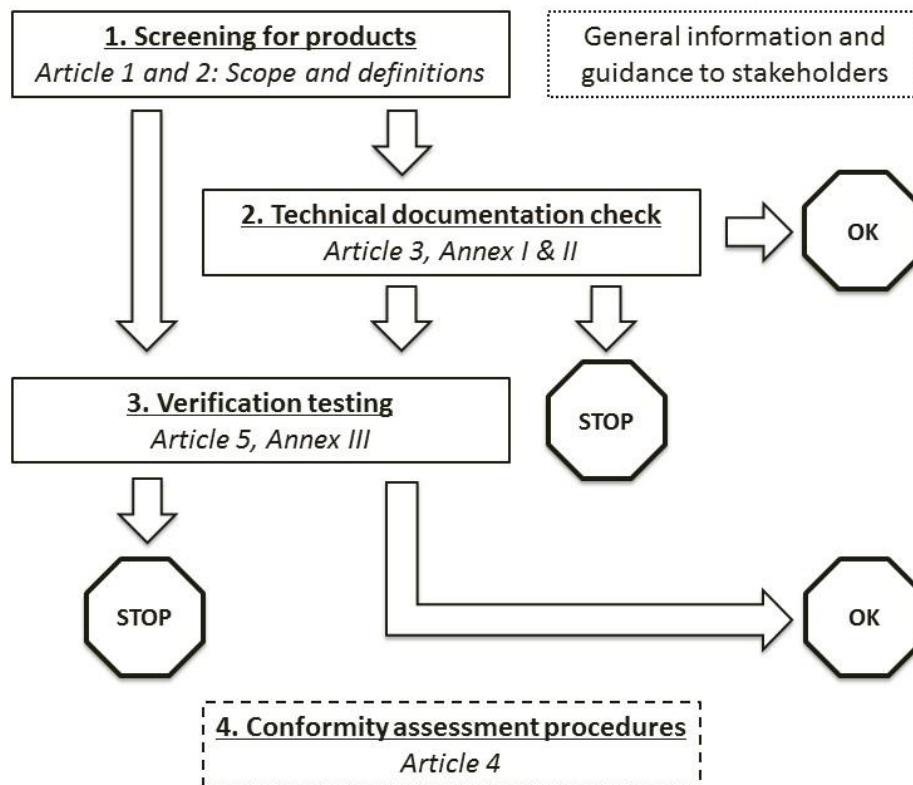


Figure 2 Activities and procedures of market surveillance authorities – the articles and annexes are referring to the Fan regulation [2]

Usually, market surveillance authorities have a number of tools they use for compliance checks, see Figure 2. First, a screening of products (1) is required to identify specific products and suppliers relevant for market surveillance activities. The authority can then choose to perform verification testing (3) on specific products or to request and check technical documentation (2). If technical documentation is checked and the result is approved as ‘OK’, the check case is closed. Otherwise, the market surveillance authorities may take additional appropriate actions, which finally could include requiring the manufacturer (or its authorized representative) to recall non-compliant

products from the market. Verification testing (3) is focused on the satisfaction of Ecodesign minimum requirements, which for fans is the overall fan efficiency. The verification procedure determines if the product complies or not. If not, the market surveillance authorities will take appropriate actions. Finally, there is an option to check conformity assessment procedures (4) which may include the manufacturer's management system. It is not current practice to do so, but market surveillance authorities would like to investigate this option further.

With the aim of developing a common approach in mind, INTAS is assessing the following testing and evaluation methods INTAS is considering at present include:

1. Those based on screening for products including desktop research as well as field studies;
2. Those based on current industry practices for which INTAS will investigate the strengths and limitations of:
 - a. scale-model testing, i.e. testing a smaller kW fan of the same design as part of series of larger fans and extrapolate findings for the larger models of the same design
 - b. part load testing, i.e. testing a fan in a part load operational point and calculating/extrapolating performance at the best efficiency point

and seeing if the performance of such approaches in independent laboratories might be suitable for Ecodesign verification purposes.

3. Participation in witness tests or factory acceptance tests to define which procedures could be specified for MSAs to assist at manufacturers' premises tests;
4. Evaluation of a consolidated approach for auditing manufacturer's conformity assessment procedures (Article 8 of the Ecodesign Directive [1]) to define recommendations on required documentation of conformity assessment, in alignment with MSAs and industry.

Based on stakeholder feedback so far, in-situ tests appear to be considered to be too complex, limited from both a technical, practical and a legal point of view.

SCREENING METHODOLOGIES

As the costs and challenges of conducting verification testing for large fans are considerable there is considerable interest in the application of risk screening processes within market surveillance processes to ensure the maximum market surveillance benefit is achieved at least cost. MSAs already have considerable and growing experience of non-conformity risk screening from the product safety but also the environmental and energy performance conformity domains, however, only limited experience thus far in applying this to large products (which reflects that Ecodesign requirements for such products are comparatively new). Unlike the mass product market MSAs are not always going to be aware if a product has been placed on the market or not (especially if no customs borders have been crossed) because of the direct B2B nature of the procurement, manufacture and placing on the market process and this presents an additional special challenge to even initiate market surveillance. In the mass product market a variety of screening techniques have been trialled and implemented successfully. They can include: establishing documentation consistency assessments as a screening tool to decide whether to opt for full verification testing or not; establishment of supplier, product and country of origin risk profiles; establishment of risk profiles linked to other conformity risk profiles – e.g. safety and environmental conformity track records, etc.

Within the context that MSAs face to conduct market surveillance of large fans INTAS is assessing the potential applicability of a variety of screening methodologies including:

- Market characterization screening to establish product types and their suppliers at industry or commercial trade fairs and similar events or fora
- Screening via the assessment of the quality of technical documentation and its internal consistency, availability of supporting evidence and implied understanding of the requirements
- Screening based on the established quality and/or independence of test reports (e.g. whether laboratories meet ISO 17025 requirements, are accredited, are 3rd party etc.)
- Screening based on the presence of other evidence supporting the veracity of the declared performance results e.g. witness testing, scale-model testing, design simulation results, QA and EMS systems in place, etc.
- Screening in cooperation with other market surveillance authorities doing inspection e.g. for the Machinery Directive (MD)
- Screening in cooperation with Customs authorities
- Screening for:
 - Nameplate information
 - Plausibility check of design

The evidence being compiled aims to establish how the presence or absence of information derived through the above processes might create a hierarchy of risk that could guide a decision regarding whether to submit a product to full verification testing or not. It could thus also imply a logical framework that is not dissimilar to the EVIA proposal.

SCALE-MODEL AND PART LOAD TESTING

Considering scaling rules, scale-model and part load testing are already described in standards and are part of commercial practice for large fans, market surveillance authorities are expected to encounter the results of such tests when checking technical documentation. From authorities' point of view, guidance on reliability, accuracy and reproducibility as well as limitations of the methods are important issues. In addition, considering the limitations in range of accredited European independent laboratories, the use of tests on smaller (identical) models in a series of fans or testing at reduced speed of larger fans may be the only way to actually perform verification tests for some products. The working document on a draft Ecodesign regulation [13] published just after the review study of the Fan regulation [14] is proposing for compliance purposes both scale model testing and tests at customer's or manufacturer's site under certain circumstances.

INTAS will investigate the practicalities of performing verification test as scale-model/part load test in independent laboratories. This will include testing of a number of industrial fans of different sizes. The outcome will be guidelines on the use of the methodology including examples based on the test results.

WITNESS TESTING

Some skepticism exist among MSAs about testing at manufacturers premises for verification purposes. This relates for instance to the legal aspect of, if the product has actually been placed on the market in accordance with the Ecodesign legislation when it is still at the premises of the manufacturer during test. Other issues concern the accuracy and transparency of the manufacturer's test procedures as well as if the product to be tested may have been optimised specifically for the verification test and do not represent the product actually placed on the market. It is evident that the situation of a market surveillance verification test differs from the commercial witness/acceptance

testing in the sense, there may not be mutual interest in the result of the test. However, in commercial contracts including acceptance/witness testing many of the practical issues are typically described and solved and with reference to available standards and guidelines.

As witness testing may be the only verification option for very large fans, INTAS will investigate the verification procedures acceptable for both MSAs and manufacturers. This may include, but is not limited to, a kind of contract template/checklist with similar content as in commercial contracts that includes acceptance/witness testing. INTAS will participate in a number of witness tests in order to adjust the methodologies. The outcome will be the development of guidelines on the use of the methodology.

AUDITING CONFORMITY ASSESSMENT PROCEDURES

Both within the tiered approach proposed by EVIA as well as via feedback from various MSAs is the notion to potentially include tools focusing on the manufacturers QA system for the part concerning conformity assessment. The Ecodesign Directive, Article 8 [1] sets down two conformity assessment procedures for manufacturers: ‘Internal design control’ or ‘Management system for assessing conformity’. These are described very generally and thus, are not very precise on specific quality issues that are important for the conformity assessment of large industrial fans. Other product directives that are dealing with health risks or safety typically have firm (standardized) procedures that include e.g. type test or certification and different types of audits.

INTAS is investigating the conformity assessment procedures of other product related legislation, manufacturer practice on management systems as well as MSAs options actually to enforce audits of conformity assessment procedures. This information is used to define recommendations on required documentation of conformity assessment, in alignment with MSAs and industry. One idea is to develop a ‘Good Ecodesign Conformity Assessment Practice for Fans’-document which describes what quality management issues must at minimum be in place for mutual acceptance of the conformity assessment procedures. If manufactures (on a voluntary basis) agree to follow the ‘Good Practice’, MSAs will have the option to audit based on that. The outcome will be guidelines on the use of such methodology.

CONCLUSIONS

The INTAS project is in the process of conducting essential work to help enable effective conformity and market surveillance assessment of large fans. As part of this process it entails the on-going establishment and strengthening of relationships and dialogues between the key actors involved in these activities and specifically between MSAs, industry and end-market actors. Several actions are being undertaken to support this including assisting MSA capacity building and networking, facilitation of information exchange, establishing dialogues with commercial actors and agencies, and the dissemination of findings. As part of this process the INTAS methodologies document is due for publication in second half of 2018, with a draft expected earlier. Interaction and engagement with the project from all relevant parties is strongly encouraged and welcome to help ensure the findings are as useful and viable as possible. Public documents will be made available on the INTAS webpage [15].

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