INTAS

INDUSTRIAL AND TERTIARY PRODUCT TESTING AND APPLICATION OF STANDARDS

Overall methodology for the targeting and compliance verification of fans and transformers

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INDUSTRIAL AND TERTIARY
PRODUCT TESTING AND
APPLICATION OF STANDARDS

METHODOLOGY

TRANSFORMERS

FANS

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About the INTAS project

The aim of the INTAS project is to provide technical and cooperative support, as well as capacity building activities, to Market Surveillance Authorities (MSAs). The need for the INTAS project arises from the difficulty that MSAs and market actors face in establishing and verifying compliance with energy performance requirements for large industrial products subject to requirements of the Ecodesign Directive, specifically transformers and industrial fans. Therefore, the project aims to:

- Support European Member State MSAs deliver compliance for large products (specifically for transformers and large fans);
- Support industry to be sure of what their obligations are under the Ecodesign Directive and to deliver compliance in a manner that will be broadly accepted by MSAs;
- Foster a common European approach to the delivery and verification of compliance for these products.

More details and publicly available reports can be found at: www.INTAS-testing.eu

LIST OF PROJECT PARTNERS

- WIP Renewable Energies / Europe
- European Environmental Citizens' Organisation for Standardisation / Europe
- European Copper Institute / Europe
- Engineering Consulting and Design / Europe
- Waide Strategic Efficiency / Europe
- Austrian Energy Agency / Austria
- Federal Public Service Health, Foodchain, Safety and Environment / Belgium
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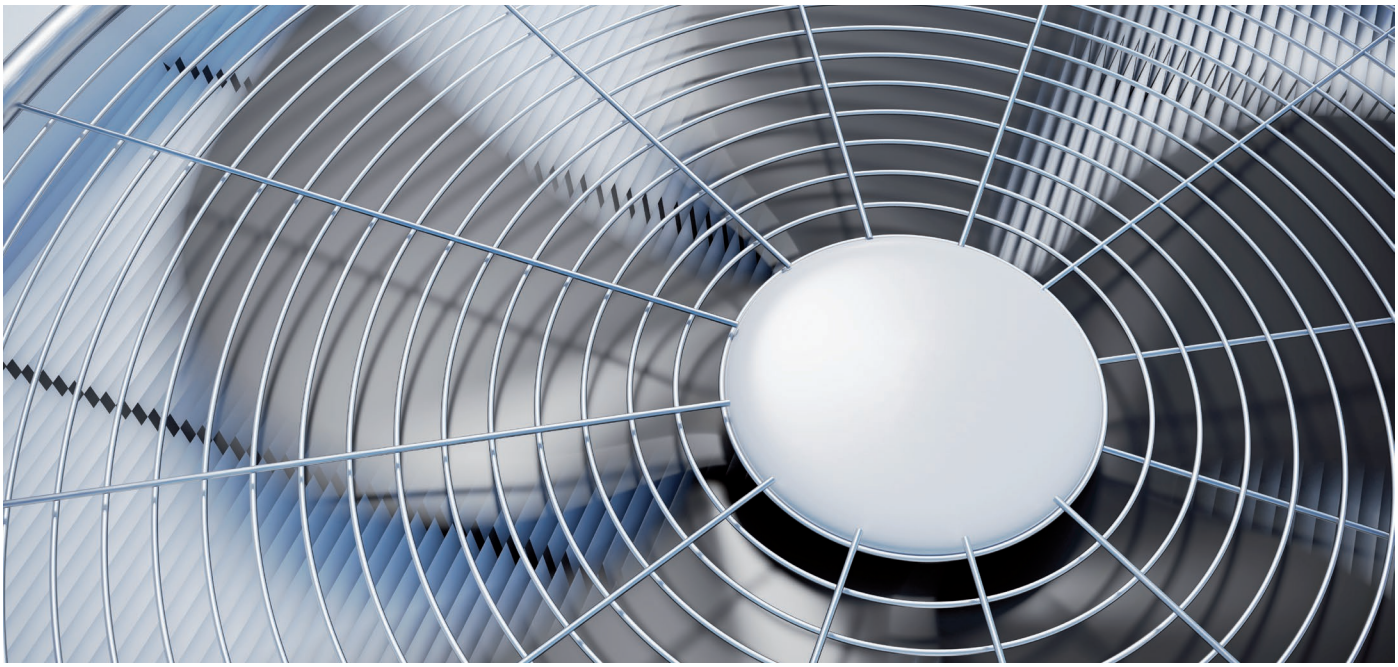

1. Introduction

This report presents the overall methodology for the targeting and compliance verification of fans and transformers as developed under the INTAS project. In so doing it sets out best practice under current circumstances but also looks forward to the options to improve on this in the future following further regulatory refinement complemented by additional technical and standardisation work.

It builds upon the findings of the preceding work, and most notably the deliverables:

- D4.1 on Final Methodology on market surveillance of large fans
- D4.2 on Final Methodology on market surveillance of transformers, and
- D4.4 on the INTAS policy recommendations.

In addition, it is also directly informed by the deliverables:

- D3.6: Best practice and experiences of both MSAs and industry regarding testing of fans
- D3.7: Best practice and experiences of both MSAs and industry regarding testing of transformers
- D3.8: Screening methodologies to target products for compliance verification.

This report does not discuss the value proposition of improving market surveillance for large products but this topic is addressed in the reports:

- D4.3: Evaluation of costs, benefits and new methods of testing, and common issues found in large product testing
- D5.2: Strategic capacity building and awareness raising at the pan-European level

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2. Ecodesign market surveillance challenges for large products

Ecodesign market surveillance for large products is complicated by the fact that these products are invariably sold via business to business (B2B) transactions and that they are often manufactured to order. The B2B nature of the products means that they are rarely the same as products displayed in a manufacturer's catalogue (although they may be derivative of such products). The manufactured-to-order nature of the products means that, unlike mass-produced products made in large series, they are only physically produced once an order is placed. From an Ecodesign market surveillance perspective these elements mean that:

- Market Surveillance Authorities (MSAs) are unaware when the product in question is commissioned, manufactured, placed on the market and even if put into service
- MSAs are unable to select a product from a catalogue at random for the purposes of conformity verification.

As a result, one of the principal difficulties for MSAs to be able to conduct Ecodesign conformity verification actions for large products, such as large power transformers and large industrial fans, is receiving information that a product has been ordered and is due to be placed on the market.

In addition to these constraints even when an MSA is aware that a product has been ordered and is due to be placed on the market the following challenges can arise:

- The product may be too large for conformity verification testing to be conducted in commercially available 3rd party testing facilities
- Accredited 3rd party testing facilities may not be available in a jurisdiction that is accepted for the purpose of legally binding conformity verification testing within the jurisdiction of the MSA
- The cost of acquiring the product for the purposes of 3rd party verification testing may be prohibitive within the budget of the MSA
- The cost of testing the product (including transportation costs) may be high
- The act of conducting verification testing at a 3rd party laboratory may necessitate delays in the product's delivery that incur prohibitive costs to the final client of the product due to delays in project completion and putting into service of the ordered product.

Within the purview of the INTAS project, which is concerned with supporting Ecodesign market surveillance for large power transformers and large industrial fans, each of these challenges has been considered and to the extent possible solutions proposed with the intention of facilitating effective market surveillance. Some of these solutions can be implemented now, within the current context that MSAs are operating, but others will require amendment to the Ecodesign regulatory framework and further development work for standardisation, technical aspects and inter-MSA cooperation to be put into place. For this reason, the following sections, which set out the INTAS project's proposed market surveillance methodologies for industrial fans and power transformers respectively, are structured to first set out the most viable methodology within the existing context and then that which can be hoped for within a future context.

3. INTAS methodology for large industrial fans

3.1 Methodology under current circumstances

The text below sets out INTAS's recommended methodology for Ecodesign market surveillance authorities to follow to ensure conformity with the requirements for large industrial fans under current circumstances.

3.1.1 General market surveillance and preparatory actions

The following general market surveillance and preparatory actions are recommended:

1. Identify market actors: manufacturers, final clients and Engineering, Procurement and Construction (EPC) contractors
2. Develop MSA technical competence with regard to large industrial fans – including identifying supporting contractors with the appropriate technical skills and market knowledge to be able to support market surveillance and conformity verification activities. Note, these are likely to include 3rd party testing facilities if such facilities exist with close enough proximity to the economy.
3. Create awareness of the requirements with both local large industrial fan producers, and local procurers of large industrial fans (be they final clients or EPCs).
4. Encourage market actors (e.g. manufacturers and procurers) to minimise project risk by informing MSAs when their activities will result in a product being placed on the market and thereby mitigate the risk of disruptive conformity verification actions occurring later in the product supply chain, when the costs and inconvenience would be greater.
5. Consider encouraging local industry to undergo a conformity assessment quality assurance review wherein a review is undertaken of the practices the company is applying to ensure their products comply with the Ecodesign regulation. Cooperation could be encouraged by: a) assuring the company that the review will respect their confidentiality and taking appropriate actions to ensure it does, b) informing companies that in the event that they undertake such a review and no conformity assessment issues are identified or all that are identified are addressed that that they will be permitted to inform their clientele that this is the situation thereby creating a positive incentive to participate because it provides a degree of assurance to their clients that their products will carry less non-conformity risk, c) in the event any company is reticent to permit such a review inform them that failure to do so increases the likelihood that their products will be selected for conformity verification assessments even if this may disrupt the installation of the product.
6. Take measures to increase the likelihood of being informed when products are being placed on the market, including:
   - Establishing links with customs so that the MSA is informed whenever a large fan is being imported and establishing data exchange mechanisms to facilitate this.
   - Consider requesting that local procurers of large fans should notify the MSA whenever they are placing an order for a large fan to facilitate the option of the MSA being able to con-

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duct conformity verification actions should they choose to. Cooperative procurers should be identified who are willing to engage in this process, perhaps beginning with those that are procuring industrial fans for use in public sector projects. A mechanism should be established for them to inform the MSA whenever an order for a large industrial fan is placed, the address and contact details of the supplier, and the expected (and subsequently actual) shipping date in time for the MSA to be able to conduct a conformity verification assessment should they choose to.

The rationale behind the actions described above is to:

a) Ensure market actors are aware of their obligations with respect to Commission Regulation (EU) No 327/2011

b) To maximise the probability that local industry have put in place adequate conformity assessment practices

c) To maximise the prospects of the MSA being informed of a product being placed on the market in time to be able to conduct conformity verification actions that have the minimum disruption for market actors

d) To ensure that imported products are not favoured over locally made ones with respect to enforcement of the regulations i.e. that there is a level playing field.

3.1.1.1 Importance of the notification process

As explained in section 2, the biggest problem to be overcome to conduct effective market surveillance for large products is to know when the product is about to be placed on the market so that MSAs have an option to conduct conformity verification actions should they wish to. Essentially, a notification process is required so that MSAs are made aware that a product will be placed on the market in time to conduct conformity assessment measures. In theory notification could happen at any of the following instances:

a) as the product order is first placed

b) once the product has been manufactured

c) in sufficient time to permit verification testing at the site of manufacture (either via an MSA's participation in a factory acceptance test (FAT) or via manufacturer "in situ" testing wherein an MSA uses 3rd party test equipment and 3rd party test laboratory staff at a manufacturer´s site)

d) as the product first enters the MSA's territory

e) as the product is transported within an MSA's territory

f) as the product is put into service.

The timing of the notification is important because once the product leaves the factory it is no longer an option to do a factory assessment test or do in situ testing at the factory. If the product is notified to the MSA at the border or during transit then it could be an option to do documentation inspections, rating plate inspections, and/or to arrange for the product to be sent to a 3rd party test laboratory for verification testing. If notification occurs once a product reaches the site of final installation it is also possible to do all of these actions but it becomes more problematic because additional delays and costs will be incurred for the final client if a product has to be re-transported to a 3rd party test lab or if it is refused the right to be installed due to non-compliant documentation or rating plates. If the MSA is only notified of a product after it has been put into service then the costs incurred to the final client from identification of non-conformity (say via technical documentation inspection) or from taking the product out of service to permit 3rd party verification testing become much higher again.

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The legal powers which MSA's have vary by EU Member State and hence the options they have to require conformity assessment at different stages in the product supply process vary. The ideal situation is one where the MSA receives very early notification that a product has been ordered and can then choose the optimal moment to conduct conformity assessment actions so that the disruption to the product supply chain is minimised. While, MSA's do not currently have the power to require producers to notify them of when a product is to be placed on the market they do have leverage because the costs and inconvenience that would be incurred to the product supply chain actors could be significantly higher if an MSA were to require conformity verification measures should take place late in the process e.g. after a product has been shipped to its final point of installation. Thus, in principle MSA's could use this leverage to encourage market actors to inform them early in the process.

3.1.2 Product screening and sample selection

3.1.2.1 Sample selection and screening

Having created awareness, built capacity and identified the market actors, screening for products and selection of samples is the next step. Large industrial products such as industrial fans are poorly suited to the product selection techniques that MSAs established and deployed for Ecodesign conformity verification targeted for smaller mass-produced products.

Given the very specific nature of the large industrial fan sector MSAs are likely to need to apply a tailored screening methodology for the selection of such industrial fans for conformity verification.

Before the product is placed on the market this could entail selecting products for the tests at manufacturer's premises.

After the product has been placed on the market this could entail:

a) a broader selection for technical documentation checks

b) a potentially slightly narrower selection for visual inspection checks (mainly checking the rating plate information)

c) a smaller sample for laboratory verification testing.

Product notification is essential to support the sample selection process. This notification could be done:

- before placing the large fan on the market or
- after placing the large fan on the market and before it is put into service.

In the following cases it will be necessary to explore the possibility of collaboration between different MSAs:

1) When the MSAs of the place where the industrial fan is produced and where it is put into service are different.
In this case, the MSA of the place where the industrial fan will be installed can contact the MSA of the place where the manufacturer is located to manage the possibility of undertaking the market surveillance verification.

2) When the industrial fan is manufactured outside the EU.
In this case, the customs authorities can contact the MSA of the place where the industrial fan will be installed to check if the local MSA has been notified.

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Before the selection of the sample, it is recommended to undertake a "Market Intelligence" exercise to gather knowledge of the market and begin to use this to establish profiles of the market actors and their importance. This can be done by contacting national manufacturer's associations and conducting web-searches to find suppliers to the local market including local and international manufacturers of large industrial fans.

The initial profiling process should aim to identify the following:

- any local manufacturers, the main characteristics of their product offer, revenues and market shares (on the local market)
- ditto for the other manufacturers supplying the local market
- importers/traders
- the contractors that install industrial fans, the sectors they work with, their size and importance
- the end-use sectors with some approximate data on their likely levels of use of industrial fan by classification.

Once this has been done it should be possible to liaise with the economic operators (especially the principal ones) and take steps to better understand their business, competences and practices with regard to industrial fans.

3.1.2.2 Site visits of local producers

At this stage an MSA could choose to make site visits of local producers which could be used to serve any of the following purposes:

- clarify information on the producer's products and markets
- ensure that the producer is familiar with the Ecodesign requirements
- gain understanding of and appraise the conformity management systems and procedures that the producer is using for conformity assessment of its products.

Additionally, such site visits could be used as a first form of informal conformity verification via:

- provisional screening of conformity assessment records for products previously placed on the market, including review of their technical documentation
- assessment of the quality of the testing facilities and calibration procedures being used
- conduct of visual inspections of available finished products for plausibility and rating plate requirements
- assessment of the design software used and checking whether the technical data from randomly selected finished products within the finished product database is likely to be in line with the Ecodesign requirements.

Most probably, it would be important for the MSA to assure the economic operator that these checks are not going to be used, at least in the first instance, for formal conformity verification checks, but rather are intended to understand the likelihood that the economic operator's products do conform to the requirements. If issues and non-conformity risks are identified via these checks then the MSA could alert the economic operator to these deficiencies and agree a process wherein they would remedy them prior to a potential future site visit and check.

Note, in many countries MSAs are likely to have the authority they need to oblige economic operators within their territory to cooperate with them; however, in some jurisdictions this may not be the case. If an economic operator does not wish to cooperate with an MSA, especially if the offer of a non-disclosure agreement is in place, then it could be indicative of bad faith and imply that there is an elevated risk of non-conformity. This could be explained to the economic operator

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and if they still wish not to cooperate the MSA could set their risk profile at high and consider taking more proactive measures to sample their products for conformity verification purposes.

3.1.2.3 Addressing products from elsewhere within the European Economic Area (EEA)

In this case, it is an option for the MSA to contact the MSA(s) with direct jurisdiction over the site(s) where these products are produced and ask them to either conduct the same type of checks they would have done and/or to supply them with information on what they know about the operations and likely conformity of the producer in question. If this information is not forthcoming the requesting MSA may consider requesting the same access to that producer as they would for a locally based one or raising the risk profile of the producer in question.

If the product is not placed on the market, MSAs can invite manufacturers to sign a voluntary agreement to allow market surveillance verification at their premises.

3.1.2.4 Addressing products made outside the EEA

Customs can identify manufacturers of large industrial fans based outside the EEA and MSAs could still seek to contact these and propose to them, as in the case of manufacturers based in the EEA, to sign a voluntary agreement to allow market surveillance verification at their premises. This agreement will avoid problems that could occur if the industrial fan is found to be non-compliant after being placed on the market.

Furthermore, products imported from outside the EEA will all be passed through a hard trade border at customs and thus MSAs should have the opportunity to be informed by customs that they have been placed on the market and to deploy conformity verification actions prior to them being put into service. The risk profiling of these products could be informed by market intelligence but also by plausibility checks based on documentation and visual inspection.

Regarding the relationship between MSAs and customs, the 'Blue Guide' on the implementation of EU products rules 2016 states the following:

> *Regulation (EC) No 765/2008 on checks for conformity with Union harmonisation legislation in the case of products imported from third countries requires the customs authorities to be closely involved in the market surveillance activities and information systems provided for under EU and national rules. Article 27(2) of Regulation (EC) No 765/2008 foresees the obligation for cooperation between customs officers and market surveillance officers. Obligations for cooperation are also included in Article 13 of the Community Customs Code which establishes that controls performed with customs and other authorities are undertaken in close cooperation between each other. In addition, the principles of cooperation between the Member States and the Commission established in Article 24 of the Regulation are extended to authorities in charge of external controls, when relevant (Article 27(5)).*

3.1.2.5 Screening and selecting products for conformity verification checks

Once sufficient details regarding economic operators have been established MSAs can begin to simultaneously take steps which will establish risk of non-conformity profiles and help to increase compliance among economic operatives. A methodology for how to apply these profiles, once established, within conformity verification sample selection actions is set out in INTAS deliverable 3.8.

As any local producers are likely to be most accessible and also to have an important position in the local market this process is likely to begin with site visits to the local producers (see 3.1.2.2).

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In addition, it will entail measures to address imported products from either within the EEA or from outside.

Based on the risk profiling activities set out above it should be possible for MSAs to progressively establish risk profiles for the economic actors serving the local market. In a simple risk profiling system there could be 4 classes of non-conformity risk per economic operator:

- low
- medium
- high
- unknown.

As more information on the economic operators becomes available the share of unknowns would decrease. Also, as higher risk economic operators are seen to take measures to improve their conformity their risk status could be amended downwards. Risk profile status of economic operators would also be adjusted in the light of outcomes from any conformity verification processes undertaken on their products.

When the MSA becomes aware that a product has been placed on the market and the supplier is known they can match it to their risk profile database to ascribe a risk status (with unknown being the default when the supplier is unknown or has no risk profile).

Based on this simple set of risk profiles the MSA can then apply a sampling algorithm to decide which products to select from a sample of potential candidates, and/or to decide whether to conduct conformity verification on a product which has just come to their attention. The weightings applied in the algorithm could take into account:

- the relative risk
- the desire to ensure there is a possibility that any product could be selected, not just the highest risk ones
- any pre-set intention to do conformity verification on a minimum or maximum number of the product type in question within a given period or given conformity verification budget envelope.

More information about how to apply the sampling algorithm and the screening process can be found in the INTAS deliverable 3.8 “Report about the screening techniques available for product/supplier targeting”

3.1.3 Conformity verification actions

This section sets out the conformity verification actions and methodologies open to MSAs once products have been selected for conformity verification assessments. The first step is to determine what conformity verification pathways are open to the MSA as a function of when in the product supply chain the product is selected for conformity verification actions.

When selecting a product, the following situations can be found:

- the product is already placed on the market or
- the product is not placed on the market.

The text below describes the available pathways under both situations.

Case where the product is already placed on the market

a) The product is not put into service

In this case, the eligible market surveillance pathway will consist of document inspection plus the following options for physical testing:

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- Testing at an independent lab
- Testing at a manufacturer's premises

b) The product is already put into service

In this case, the market surveillance pathways will consist of document inspection plus in situ testing.

Case where the product is not placed on the market

In this case, the manufacturer has not performed the conformity assessment yet, and the assessment includes a test, this can be used for market surveillance purposes if there is an agreement ([1]) between the manufacturer and the MSA.

Documentation inspection can only be conducted after the manufacturer conformity assessment has been performed.

3.1.3.1 Documentation and rating plate inspection

The process of conducting documentation inspection for large fans is set out in section 2.3 of INTAS deliverable 4.1 "Final Methodology on market surveillance of large fans". The result of documentation inspection will be to show if a product is compliant or not with that aspect of the Ecodesign regulations, but it will not show (at least definitely) whether the product's declared energy performance is correct or not. For that step verification testing is needed.

3.1.3.2 Verification testing

The process of conducting verification testing for large fans is set out in section 2.4. of INTAS deliverable 4.1 "Final Methodology on market surveillance of large fans". There are several testing cases that can be envisaged as discussed below.

Full size, real speed testing on a standardized airway

If a suitable standardized airway exists, the fan efficiency is tested straight ahead at declared speed, in best efficiency point and in accordance with EN ISO 5801.

PROS +

- The unit of the model to be verified is the real size fan (in accordance with Commission Regulation (EU) No 2016/2282, Annex X)
- The real size fan is tested at declared conditions.

CONS −

- In case of large and very large fans, standardised airways and measuring equipment may not be available due to their high costs and space requirements.

Full size testing, at modified speed, on a standardised airway

When a suitable standardized test airway is not available, the real size fan can be tested at a speed being different from the declared one. In this case, the fan drive system efficiency must be determined separately. The fan impeller efficiency is then calculated at real speed. Multiplied with the fan drive system efficiency at real speed, the overall fan energy efficiency is determined.

[1] voluntary agreement between manufacturer/supplier and MSA, or between MSA and client, to allow market surveillance verification at manufacturer/supplier premises. This agreement can be a general agreement for a fixed period of time (for example, a year) or agreement only for a sample and could be similar to existing agreements between fan manufacturers and clients for witnessing FATs

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PROS +

- Can be used to avoid exceeding the maximum capacity of the standardized airway available
- Can be used to avoid exceeding the maximum electric power capacity of the testing laboratory
- The unit of the model to be verified is the real size fan (in accordance with Commission Regulation (EU) No 2016/2282, Annex X)

CONS −

- Is typically only applicable down to a certain reduced speed e.g. 70% and thus, does not solve all problems as it still requires a standardized airway accordingly suitable.
- Requires the determination of the fan drive system efficiency at full speed by other means.

Scaled model/sub-scale testing on a standardised airway

Scaled model or sub-scale model testing is a method to determine the performance of a larger fan based on the testing of a geometrically similar smaller fan. It is applicable, when there is no suitable standardised airway available for the larger fan. The smaller fan is tested on a suitable standardised test rig, in the best efficiency point and in accordance with EN ISO 5801 and EN ISO 13348. When performance is scaled, it will usually be the fan impeller efficiency that is scaled. When the overall energy efficiency of the larger fan is calculated, it must use the fan drive system efficiency of the larger fan. It is important that an assessment of the geometrical similarity of the smaller and larger fan is made.

PROS +

- A scaled fan can be tested by an independent accredited laboratory as it can be selected to fit to the capacity of such laboratories.
- Can be cheaper than testing the real size fan.
- A smaller fan is easier to handle and transport which keeps the costs down.
- If acquisition is required, the scaled fan is affordable compared to a larger fan.

CONS −

- It requires some extra time to specify, and later on check that the smaller fan design is geometrically similar to the larger fan design.
- The delivery time of an order-made smaller/scaled fan may be 4–6 weeks or even longer.
- In case the scaled fan does not comply with the minimum requirements of the regulation (or is close to not complying), there may be situations, where the tolerances of the calculations cannot justify the decision to reject the larger fan as non-compliant if such an approach is taken.

Full-size testing, on site

When a suitable standardized test airway is not available, and the other testing methods presented cannot be used or the product has already been put into service, the only option may be to test on site. The test is carried out with the provisions of EN ISO 5802.

PROS +

- Can be the only testing option available
- Certainty about the product has been placed on the market and/or put into service
- No delays in delivery of the fan to the customer related to testing

CONS −

- Difficult technical aspects of testing on-site compared to testing on standardised airways
- From an MSA perspective there will be a number of critical issues on on-site testing concerning e.g. legal aspects that goes beyond the uncertainty of the measurements:
  - Lack of corrective actions when first the customer's investment is made, and the product is installed
  - Problems related to getting access to the site
  - Covering economical losses related to interruption of production

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In addition to the type of testing described above MSA's also have to consider the question of the choice of the test laboratory and the independence of the testing as now described.

Independent laboratory

There exist a reasonable number of accredited laboratories in Europe capable of testing fans. Many of these are targeting fans used for ventilation of buildings or in machine building, where the majority of products are specified for pressures below 1,000 Pa and electric power input below 10 kW. Fans for industrial applications and in scope of the Commission Regulation (EU) No 327/2011 may be specified for pressures beyond 10,000 Pa and electric input power up to 500 kW.

In the INTAS project a survey was made among European accredited laboratories on their testing capabilities in terms of pressure, flow rate, electric power capacity, max weight and impeller diameter among others. Based on a non-exhaustive list of answers and combining the input, the indicative overview table below was established, see Table 1. The table shows for different flow rates and pressures, the indicative electric power input assuming a drive system efficiency of 90%. The likelihood of finding a laboratory of a certain capacity is indicated with different colours. According to the survey and the table, it is unlikely to find independent European accredited test facilities that can handle industrial fans with electric power input above 50–60 kW.

TABLE 1

INDICATIVE LIKELIHOOD OF INDEPENDENT LABORATORY CAPACITY.
THE ELECTRIC POWER INPUT IS SHOWN AT DIFFERENT FLOW RATES AND PRESSURES.

Drive system efficiency = 0.9	FLOW RATE [m³/h]					
	5,000	15,000	25,000	35,000	50,000	75,000
PRESSURE [Pa]	ELECTRIC POWER [kW]					
2,500	3.9	11.6	19.3	27.0	38.6	57.9
5,000	7.7	23.1	38.6	54.0	77.2	115.7
7,500	11.6	34.7	57.9	81.0	115.7	171.6
10,000	15.4	46.3	77.2	108.0	154.3	231.5

Widely available | Available | Less available | Unlikely

Testing at a manufacturer laboratory, using manufacturer measuring equipment

The landscape of manufacturer test facilities is more diverse ranging from manufacturers having complete facilities covering their full product range (even up to 500 kW) to manufacturers having limited facilities which are mainly used for R&D and thus not necessarily strictly follow the specifications of e.g. EN ISO 5801. Another experience is that the overall fan efficiency cannot always be measured, if the manufacturer focuses on measuring the fan impeller efficiency (mechanically) only.

In case the manufacturer laboratory, including the manufacturer equipment, is to be used for verification test at least the following must be checked:

- Suitable standardised airway available
- Electric power capacity available
- Measuring equipment/calibration certificates/other documentation
- Data acquisition and conversion formulas

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Factory acceptance testing (FAT) at manufacturers premises is not very common in the industrial fan business – at least not for fans in scope of Commission Regulation (EU) No 327/2011. However, for those manufacturers doing FATs on a regular basis, there is the option that the MSA can participate a witness test, where the performance of the fan is demonstrated along with the customer. Alternatively, the witness test can take place just before or after the customers FAT, to avoid any disturbance of the customer relationship with the manufacturer. In this case the MSA and fan manufacturer should agree on the conditions of the test which could be based on commercial practice, e.g. with reference to EN ISO 13348, but with the use of tolerances according to Commission Regulation (EU) No 327/2011.

PROS +

- Relatively low costs if conducted along with an ongoing FAT

CONS −

- The use of manufacturer measuring equipment may not support the requirements on using reliable, accurate and reproducible methods.
- Planning of the test can be difficult

Manufacturer laboratory, independent laboratory measuring equipment

A variant of the above procedure is testing by independent laboratory using own measuring equipment instead of the manufacturer measuring equipment. Standardised airways, variable speed drives (VSDs) and other parts of the test rig must still be provided by the manufacturer.

PROS +

- The use of accredited laboratories supports the requirements on using reliable, accurate and reproducible methods.

CONS −

- Higher cost than for the option using manufacturer testing equipment.

In-situ, independent party measuring equipment

In cases where no other options are available, in-situ testing can be the only way to test a fan. The in-situ testing by independent laboratory using own measuring equipment should be in accordance with EN ISO 5802. The In-situ test may preferably take place in the commissioning phase of the fan.

PROS +

- May be the only option
- The use of independent accredited laboratories supports the requirements on using reliable, accurate and reproducible methods.

CONS −

- Testing method less accurate than when testing on standardised airways
- May not be possible to test the fan in best efficiency point
- In general, difficult to conduct if the fan is already installed and in operation for its dedicated purpose.

Summary of viability of testing options

Conformity verification test results will be indisputably legally enforceable if they are conducted by a 3rd party test laboratory in accordance with standardised test procedures at full speed and rated power. However, this is not an option for fans above a certain rated capacity because 3rd party test laboratories are not currently available in the EU with the capability of testing such products. Table 1 show the availability of accredited 3rd party test facilities in the EU as a function of fan pressure and flow rate (and the corresponding rated power of the fans show in the body of the table)

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as identified in the INTAS project. This shows there is a dearth of testing facilities above 50–60 kW of rated power, despite that the Ecodesign regulation covers fans of up to 500 kW of rated power.

Scaled-model and part-load testing is a technical means of using the current 3rd party testing facilities to conduct verification testing but one that may not produce legally enforceable outcomes. Full-size in situ testing at the place the product is put into service may be an option of last resort if standardised airways needed to do testing in a 3rd party laboratory are not available, but it may not produce legally enforceable outcomes.

Thus, for products of a rated capacity above ~ 50–60 kW the certainty of having legally enforceable test verification results is not assured and MSAs may therefore chose to rely on other means of establishing conformity. Aside from documentation inspection these could include manufacturing premises inspections to verify that the conformity declaration is correctly substantiated by the manufacturer's own information.

3.1.3.3 Final flowchart

The final flowchart setting out the INTAS market surveillance methodology for industrial fans under current circumstances is show in Figure 1 on the next page.

3.2 Methodology under future circumstances

The text below sets out INTAS's recommended methodology for Ecodesign market surveillance authorities to follow to ensure conformity with the requirements for large industrial fans under future circumstances when it is hoped that the INTAS project recommendations with regard to policy and technical development have been implemented. Essentially the methodology to be applied will be the same as under current circumstances except for the differences explained below.

3.2.1 Mandatory product notification

In the future it is hoped that the Ecodesign regulations will be amended to require mandatory notification to MSA's whenever a large industrial fan is to be placed on the market. This will remove the current uncertainty with respect to knowing when a product is placed on the market and will also remove the need for MSAs to set up voluntary informal notification processes as described in section 3.1.1.1.

The precise recommendations are set out in INTAS deliverable 4.4.

3.2.2 Standardisation

There is currently no harmonised test procedure acknowledged with the Ecodeign regulation for the purposes of conformity assessment and verification testing of industrial fans. In the future it is hoped that this situation will have been remedied.

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FIGURE 1

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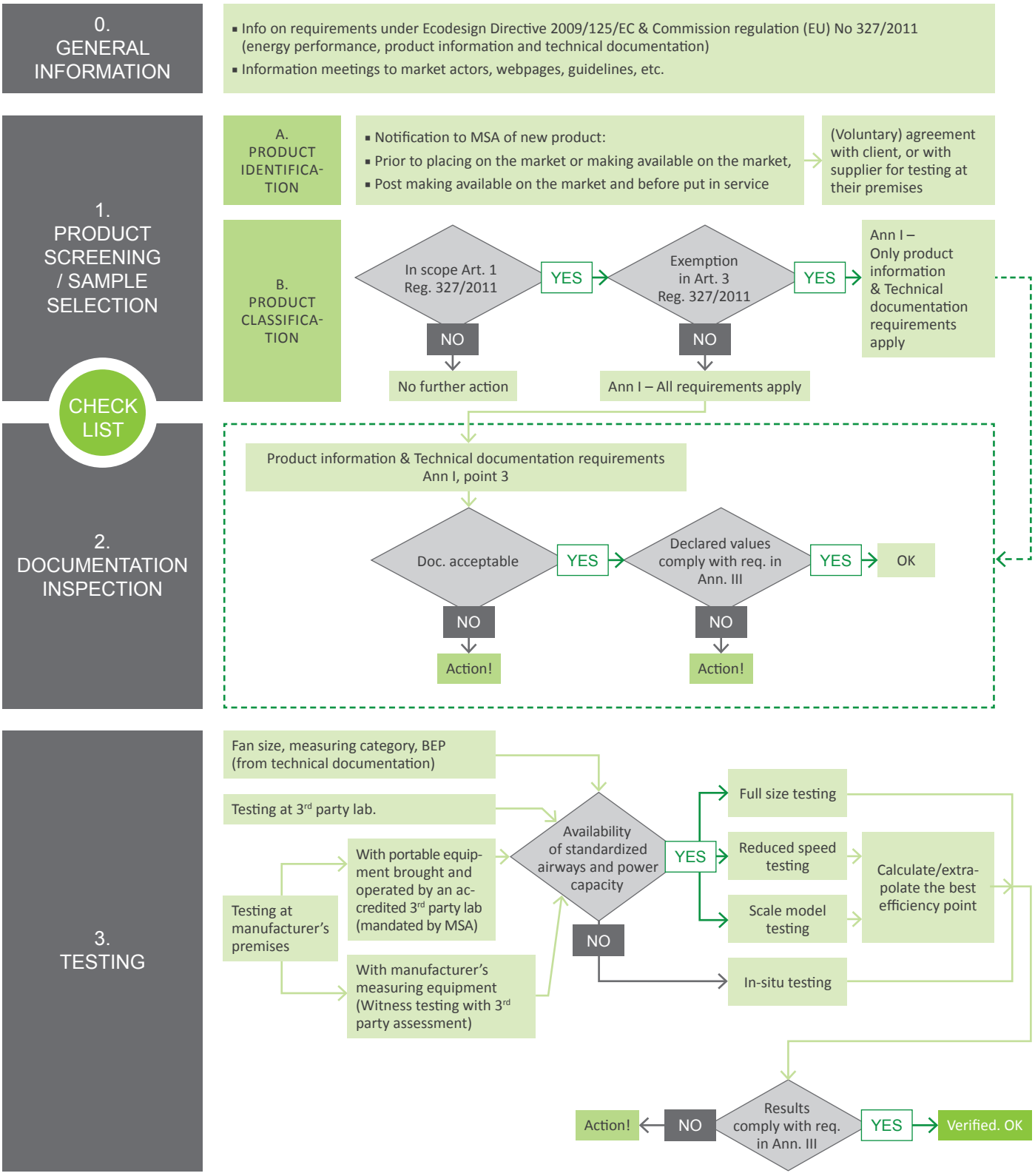
FINAL FLOWCHART
OF THE INTAS METHODOLOGY
FOR LARGE INDUSTRIAL FANS



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3.2.3 Witness testing of Factory Acceptance tests

Factory acceptance tests (FATs) are currently only done for a minority of large industrial fans and in particular those that are destined for sensitive applications in terms of human health risk. The Ecodesign regulation for large power transformers already allows MSAs to use witnessing of FATs as a conformity verification pathway, but there are no equivalent provisions in Commission Regulation (EU) No 327/2011 for fans and thus the legal status of such witness FATs for ecodesign non-conformity verification purposes and the mandate of MSAs to demand the right to witness FATs for this purpose are less certain. In the future it is hoped that both will be clarified by amendments to the Commission Regulation (EU) No 327/2011.

3.2.4 Verification testing

Currently accredited 3rd party testing facilities are not available to conduct full-scale verification testing of large fans above ~ 40–45 kW of rated capacity and while facilities can test scale models or at part-load these may be legally unenforceable and may not yet be sufficiently well proven and defined.

In the future it is hoped that actions will have been taken to:

- clearly establish the methods to be applied in using scale model and part-load testing
- clearly establish their uncertainties and corresponding tolerances
- written these into harmonised standards
- give these full legal force as a verification testing option under the future version of Commission Regulation (EU) No 327/2011.

3.2.5 Development of non-conformity risk assessment methods

In principle, non-conformity risk assessment methods can be elaborated that will enhance the cost-effectiveness of market surveillance. With this aim in mind the fan industry association, EVIA, has been elaborating a visual inspection guide that is intended to allow MSAs and others to identify the likelihood that a fan might not comply with the energy performance regulations through a simple visual inspection, and that this could be applied as a cost-effective intermediate process to screen products prior to sending more likely uncompliant products for 3rd party verification testing. In the future it is hoped that all necessary work will have ben done to develop these methods and establish their accuracy and limits, so that they can be deployed by MSAs to increase their coverage of the market within available budgets.

3.2.6 Design calculation assessment

The development of conformity verification methods based on qualified 3rd party assessment of manufacturer's design calculation methodology and declarations are likely to be particularly useful for large industrial fans. The INTAS project is informed that fan manufacturers routinely use design calculation software to develop fan designs and to estimate their physical properties, including those related to their energy performance. While all manufacturer's use such software tools a part of the industry is understood to rely on them exclusively and undertakes no additional

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performance verification testing. Establishing mechanisms to validate the software used to ensure that it produces acceptably accurate projections of product energy performance is therefore likely to be a useful additional tool for MSAs to use to raise conformity with regulations. There is a need for both technical development work to develop a set of benchmarks and for regulatory development to require software used for energy performance declaration of large industrial fans to be corroborated. There is also potential to enable and require fan suppliers to submit design software files for their products on demand so that MSA experts can simulate the performance using the benchmark software to see if the values match the declared values and respect the requirements of Commission Regulation (EU) No 327/2011 or its future iterations. Establishing such a conformity verification pathway would greatly facilitate Ecodesign market surveillance, as it would allow models outside the range of current testing facilities to be controlled and verified and, if linked to a mandatory notification system, would greatly reduce the cost of conducting conformity verification assessments.

3.2.7 Cooperation between MSAs

There is much that MSAs can do to cooperate to facilitate conformity verification actions across the EU. Most pressingly, a mechanism needs to be in place to inform the MSA where a product is due to be put into service when a product has arrived at the point of entry into the EEA (which may not be within the same country as where a product is due to be put into service).

Additionally, MSAs could cooperate by:

- sharing conformity verification findings and economic operator risk profile information
- supporting requests from an MSA based in another EEA jurisdiction to conduct site inspections of a manufacturer based within the requested MSA's jurisdiction
- pooling resources to conduct a more holistic market surveillance process for large industrial fans.

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4. INTAS methodology for power transformers

4.1 Methodology under current circumstances

The text below sets out INTAS's recommended methodology for Ecodesign market surveillance authorities to follow to ensure conformity with the requirements for power transformers under current circumstances.

4.1.1 General market surveillance and preparatory actions

The following general market surveillance and preparatory actions are recommended:

1. Identify market actors (manufacturers, final clients (such as electricity utilities Transmission Services Operators (TSOs) and Distribution Services Operators (DSOs)) and large industry) and EPCs)
2. Develop MSA technical competence with regard to large power transformers – including identifying supporting contractors with the appropriate technical skills and market knowledge to be able to support market surveillance and conformity verification activities. Note, these are likely to include 3rd party testing facilities if such facilities exist with close enough proximity to the economy.
3. Create awareness of the requirements with both local power transformer producers, and local procurers of large power transformers (be they final clients (TSOs, DSOs, industry) or EPCs).
4. Encourage market actors (e.g. manufacturers and procurers) to minimise project risk by informing MSAs when their activities will result in a product being placed on the market and thereby mitigate the risk of disruptive conformity verification actions occurring later in the product supply chain, when the costs and inconvenience would be greater.
5. Consider encouraging local power transformer manufacturers to undergo a conformity assessment quality assurance review wherein a review is undertaken of the practices the company is applying to ensure their products comply with the Ecodesign regulation. Cooperation could be encouraged by:
   a) assuring the company that the review will respect their confidentiality and taking appropriate actions to ensure it does,
   b) informing companies that in the event that they undertake such a review and no conformity assessment issues are identified or all that are identified are addressed that that they will be permitted to inform their clientele that this is the situation thereby creating a positive incentive to participate because it provides a degree of assurance to their clients that their products will carry less non-conformity risk,
   c) in the event any company is reticent to permit such a review inform them that failure to do so increases the likelihood that their products will be selected for conformity verification assessments even if this may disrupt the installation of the product.

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6. Take measures to increase the likelihood of being informed when products are being placed on the market, including:
   - Establishing links with customs so that the MSA is informed whenever a large power transformer is being imported and establishing data exchange mechanisms to facilitate this
   - Consider requesting that the authorities responsible for granting permits to transport very large products (e.g. on roads, rail etc.) should inform the MSA whenever such a permit is requested for a large power transformer and should pass the details of the product, the transport agent, the route and dates to the MSA
   - Consider requesting that local procurers of large power transformers should notify the MSA whenever they are placing an order for a large power transformer to facilitate the option of the MSA being able to conduct conformity verification actions should they choose to. Cooperative procurers should be identified who are willing to engage in this process, in particular among electricity utilities such as TSOs and DSOs, but also large industrial procurers. A mechanism should be established for them to inform the MSA whenever an order for a large power transformer is placed, the address and contact details of the supplier, and the expected (and subsequently actual) shipping date in time for the MSA to be able to conduct a conformity verification assessment should they choose to
   - Additionally, as all power transformers have to undergo compulsory electrical safety checks conducted by conformity assessment bodies (CAB) before they are put into service it is strongly recommended that Ecodesign MSAs establish contact with the CAB(s) responsible for this function and request that they be informed every time the CAB becomes aware that a power transformer will be put into service. MSAs can use this knowledge to encourage manufacturers and procurers to notify them voluntarily when an order is first placed (rather than after the product has been placed on the market) so that witnessing of factory acceptance testing can be undertaken (see section 4.1.3.2) in preference to more disruptive and costly conformity verification testing.

The rationale behind the actions described above is to:

a) Ensure market actors are aware of their obligations with respect to Commission Regulation (EU) No 548/2014

b) To maximise the probability that local industry have put in place adequate conformity assessment practices

c) To maximise the prospects of the MSA being informed of a product being placed on the market in time to be able to conduct conformity verification actions that have the minimum disruption for market actors

d) To ensure that imported products are not favoured over locally made ones with respect to enforcement of the regulations i.e. that there is a level playing field.

4.1.1.1 Importance of the notification process

As explained in section 2, the biggest problem to be overcome to conduct effective market surveillance for large products is to know when the product is about to be placed on the market so that MSAs have an option to conduct conformity verification actions should they wish to. Essentially, a notification process is required so that MSAs are made aware that a product will be placed on the market in time to conduct conformity assessment measures. In theory notification could happen at any of the following instances:

a) as the product order is first placed

b) once the product has been manufactured

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c) in sufficient time to permit verification testing at the site of manufacture (either via an MSA's participation in a factory acceptance test (FAT) or via manufacturer "in situ" testing wherein an MSA uses 3rd party test equipment and 3rd party test laboratory staff at a manufacturer´s site)

d) as the product first enters the MSA's territory

e) as the product is transported within an MSA's territory

f) as the product is put into service.

The timing of the notification is important because once the product leaves the factory it is no longer an option to do a factory assessment test or do in situ testing at the factory. If the product is notified to the MSA at the border or during transit then it could be an option to do documentation inspections, rating plate inspections, and/or to arrange for the product to be sent to a 3rd party test laboratory for verification testing. If notification occurs once a product reaches the site of final installation it is also possible to do all of these actions but it becomes more problematic because additional delays and costs will be incurred for the final client if a product has to be re-transported to a 3rd party test lab or if it is refused the right to be installed due to non-compliant documentation or rating plates. If the MSA is only notified of a product after it has been put into service then the costs incurred to the final client from identification of non-conformity (say via technical documentation inspection) or from taking the product out of service to permit 3rd party verification testing become much higher again.

The legal powers which MSA's have vary by EU Member State and hence the options they have to require conformity assessment at different stages in the product supply process vary. The ideal situation is one where the MSA receives very early notification that a product has been ordered and can then choose the optimal moment to conduct conformity assessment actions so that the disruption to the product supply chain is minimised. While, MSA's do not currently have the power to require producers to notify them of when a product is to be placed on the market they do have leverage because the costs and inconvenience that would be incurred to the product supply chain actors could be significantly higher if an MSA were to require conformity verification measures should take place late in the process e.g. after a product has been shipped to its final point of installation. Thus, in principle MSA's could use this leverage to encourage market actors to inform them early in the process.

4.1.2 Product screening and sample selection

4.1.2.1 Sample selection and screening

Having created awareness, built capacity and identified the market actors, screening for products and selection of samples is the next step. Large industrial products such as power transformers are poorly suited to the product selection techniques that MSAs established and deployed for Ecodesign conformity verification targeted for smaller mass-produced products.

Given the very specific nature of the power transformer sector MSAs are likely to need to apply a tailored screening methodology for the selection of such power transformers for conformity verification.

Before the product is placed on the market this could entail selecting products for the tests at manufacturer's premises.

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After the product has been placed on the market this could entail a:

a) broader selection for technical documentation checks

b) potentially slightly narrower selection for visual inspection checks (mainly checking the rating plate information)

c) smaller sample for laboratory verification testing.

Product notification is essential to support the sample selection process. This notification could be done:

- before placing the power transformer on the market or
- after placing the power transformer on the market and before it is put into service
- or even after putting into service, although this would be less effective for market surveillance purposes.

In the following cases it will be necessary to explore the possibility of collaboration between different MSAs:

1. When the MSAs of the place where the power transformer is produced and where it is put into service are different.
   In this case, the MSA of the place where the transformer will be installed can contact the MSA of the place where the manufacturer is located to manage the possibility of market surveillance tests at the manufacturer‘s premises.
2. When the power transformer is manufactured outside the EU.
   In this case, the customs authorities can contact the MSA of the place where the transformer will be installed to check if the notification has been made.

Before the selection of the sample, it is recommended to undertake a “Market Intelligence” exercise to gather knowledge of the market and begin to use this to establish profiles of the market actors and their importance. This can be done by contacting national manufacturer’s associations and conducting web-searches to find suppliers to the local market including local and international manufacturers of power transformers.

The initial profiling process should aim to identify the following:

- any local manufacturers, the main characteristics of their product offer, revenues and market shares (on the local market)
- ditto for the other manufacturers supplying the local market
- importers/traders
- the contractors that install power transformers, the sectors they work with, their size and importance
- the end-use sectors with some approximate data on their likely levels of use of power transformer by type.

Once this has been done it should be possible to liaise with the economic operators (especially the principal ones) and take steps to better understand their business, competences and practices with regard to power transformers.

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4.1.2.2 Site visits of local producers

At this stage an MSA could choose to make site visits of local producers which could be used to serve any of the following purposes:

- clarify information on the producer's products and markets
- ensure that the producer is familiar with the Ecodesign requirements
- gain understanding of and appraise the conformity management systems and procedures that the producer is using for conformity assessment of its products.

Additionally, such site visits could be used as a first form of informal conformity verification via:

- provisional screening of conformity assessment records for products previously placed on the market, including review of their technical documentation
- assessment of the quality of the testing facilities and calibration procedures being used
- conduct of visual inspections of available finished products for plausibility and rating plate requirements
- assessment of the design software used and checking whether the technical data from randomly selected finished products within the finished product database is likely to be in line with the Ecodesign requirements.

Most probably, it would be important for the MSA to assure the economic operator that these checks are not going to be used, at least in the first instance, for formal conformity verification checks, but rather are intended to understand the likelihood that the economic operator's products do conform to the requirements. If issues and non-conformity risks are identified via these checks then the MSA could alert the economic operator to these deficiencies and agree a process wherein they would remedy them prior to a potential future site visit and check.

Note, in many countries MSAs are likely to have the authority they need to oblige economic operators within their territory to cooperate with them; however, in some jurisdictions this may not be the case. If an economic operator does not wish to cooperate with an MSA, especially if the offer of a non-disclosure agreement is in place, then it could be indicative of bad faith and imply that there is an elevated risk of non-conformity. This could be explained to the economic operator and if they still wish not to cooperate the MSA could set their risk profile at high and consider taking more proactive measures to sample their products for conformity verification purposes.

4.1.2.3 Addressing products from elsewhere within the EEA

In this case, the MSA should still be granted access to undertake the verification procedure at producer's premises due to the clause regarding witness testing specified within Annex III of the regulation providing the producer is known to supply products to the MSA's market. However, it is also an option for the MSA to contact the MSA(s) with direct jurisdiction over the site(s) where these products are produced and ask them to either conduct the same type of checks they would have done and/or to supply them with information on what they know about the operations and likely conformity of the producer in question. If this information is not forthcoming the requesting MSA may consider requesting the same access to that producer as they would for a locally based one or raising the risk profile of the producer in question

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4.1.2.4 Addressing products made outside the EEA

Customs can identify suppliers of large power transformers based outside the EEA and MSAs could still seek to contact these and proceed in the same manner they would for producers based in the EEA. Furthermore, products imported from outside the EEA will all be passed through a hard trade border at customs and thus MSAs should have the opportunity to be informed by customs that they have been placed on the market and to deploy conformity verification actions prior to them being put into service. The risk profiling of these products could be informed by market intelligence but also by plausibility checks based on documentation and visual inspection.

Regarding the relationship between MSAs and customs, the 'Blue Guide' on the implementation of EU products rules 2016 states the following:

> *Regulation (EC) No 765/2008 on checks for conformity with Union harmonisation legislation in the case of products imported from third countries requires the customs authorities to be closely involved in the market surveillance activities and information systems provided for under EU and national rules. Article 27(2) of Regulation (EC) No 765/2008 foresees the obligation for cooperation between customs officers and market surveillance officers. Obligations for cooperation are also included in Article 13 of the Community Customs Code which establishes that controls performed with customs and other authorities are undertaken in close cooperation between each other. In addition, the principles of cooperation between the Member States and the Commission established in Article 24 of the Regulation are extended to authorities in charge of external controls, when relevant (Article 27(5)).*

4.1.2.5 Screening and selecting products for conformity verification checks

Once sufficient details regarding economic operators have been established MSAs can begin to simultaneously take steps which will establish risk of non-conformity profiles and help to increase compliance among economic operatives. A methodology for how to apply these profiles, once established, within conformity verification sample selection actions is set out in INTAS deliverable 3.8.

As any local producers are likely to be most accessible and also to have an important position in the local market this process is likely to begin with site visits to the local producers (see 4.1.2.2). In addition, it will entail measures to address imported products from either within the EEA or from outside.

Based on the risk profiling activities set out above it should be possible for MSAs to progressively establish risk profiles for the economic actors serving the local market. In a simple risk profiling system there could be 4 classes of non-conformity risk per economic operator:

- low
- medium
- high
- unknown.

As more information on the economic operators becomes available the share of unknowns would decrease. Also, as higher risk economic operators are seen to take measures to improve their conformity their risk status could be amended downwards. Risk profile status of economic operators would also be adjusted in the light of outcomes from any conformity verification processes undertaken on their products.

When the MSA becomes aware that a product has been placed on the market and the supplier is known they can match it to their risk profile database to ascribe a risk status (with unknown being

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the default when the supplier is unknown or has no risk profile).

Based on this simple set of risk profiles the MSA can then apply a sampling algorithm to decide which products to select from a sample of potential candidates, and/or to decide whether to conduct conformity verification on a product which has just come to their attention. The weightings applied in the algorithm could take into account:

- the relative risk
- the desire to ensure there is a possibility that any product could be selected, not just the highest risk ones
- any pre-set intention to do conformity verification on a minimum or maximum number of the product type in question within a given period or given conformity verification budget envelope.

More information about how to apply the sampling algorithm and the screening process can be found in the INTAS deliverable 3.8 "Report about the screening techniques available for product/supplier targeting"

4.1.3 Conformity verification actions

This section sets out the conformity verification actions and methodologies open to MSAs once products have been selected for conformity verification assessments. The first step is to determine what conformity verification pathways are open to the MSA as a function of when in the product supply chain the product is selected for conformity verification actions.

When selecting a product, the following situations can be found:

- the product is already placed on the market or
- the product is not placed on the market.

The text below describes the available pathways under both situations.

Case where the product is already placed on the market

a) The product is not put into service
In this case, the eligible market surveillance pathway will consist of document inspection plus the following options for physical testing:

- Testing at an independent lab
- Testing at a manufacturer's premises.

b) The product is already put into service
In this case, the market surveillance pathways will consist of document inspection plus in situ testing.

Case where the product is not placed on the market

In this case, the manufacturer has not performed the conformity assessment yet, and the assessment includes a test, this can be used for market surveillance purposes if there is an agreement ([2]) between the manufacturer and the MSA.

Documentation inspection can only be conducted after the manufacturer conformity assessment has been performed.

[2] voluntary agreement between manufacturer/supplier and MSA, or between MSA and client, to allow market surveillance verification at manufacturer/supplier premises. This agreement can be a general agreement for a fixed period of time (for example, a year) or agreement only for a sample and could be similar to existing agreements between fan manufacturers and clients for witnessing FATs

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In the case the conformity assessment has been completed and technical documentation is available, but the product has not yet been placed on the market (first economic transaction has not been done) the market surveillance process will consist of:

- document inspection
- visual inspection
- testing at an independent lab (after the product has been placed on the market)
- re-testing at the manufacturer's premises (conducted in sequence with the conformity assessment test of the manufacturer before the product leaves the manufacturer's premises).

4.1.3.1 Documentation inspection

The process of conducting documentation inspection for large power transformers is set out in section 2.3 of INTAS deliverable 4.2 "Final Methodology on market surveillance of transformers". The result of documentation inspection will be to show if a product is compliant or not with that aspect of the Ecodesign regulations, but it will not show (at least definitely) whether the product's declared energy performance is correct or not. For that step verification testing is needed.

4.1.3.2 Verification testing

The process of conducting verification testing for power transformers is set out in section 2.4. of INTAS deliverable 4.1 "Final Methodology on market surveillance of transformers". MSA's have to consider the question of the choice of the test laboratory and the independence of the testing as now described.

Independent laboratory

The transformer to be verified is transported from the manufacturer's premises, end user installation or warehouse to the independent lab premises and tested there by the lab staff using their own measuring equipment.

PROS +

- Using accredited laboratories provides greater accuracy in accordance with the harmonised standards measurements. These measurements could be used to prove non-conformity within a court of law.
- Using independent laboratories guarantees the independence of the market surveillance process.
- The pure testing costs (i.e. ignoring product transport costs) are lower than in the other options set out below because there are no costs associated with staff travel or transportation of the measuring equipment.

CONS −

- The testing capability of independent laboratories is limited. Most of the available laboratories have limitations in the size, power or voltage of the transformers they can test
- There may be significant costs associated with purchasing the transformer, although in some instances a specific agreement can be made with the manufacturer in order to have the sample product for free for the period of time needed to do the testing, in some cases, national legislation may not allow this
- Costs of transporting the transformer to the laboratory may not be negligible. In particular, large power transformers are extremely heavy and difficult and costly to transport for testing in independent labs.
- Costs of installing the transformer at the laboratory in preparation of the tests

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- Respecting installation dates can be critical for the scheduled operation of power networks and any delays in these due to 3rd party testing risk incurring unacceptable inconvenience and costs for the economic operators using the transformer
- There may be a lack of laboratories in the national territory. Yet in some cases, national legislation may not allow testing in laboratories outside the national territory.

A brief guide about how select an independent lab can be found in Appendix B of INTAS deliverable 4.2.

Testing at a manufacturer's laboratory, using the manufacturer's measuring equipment

Testing could occur before the product is placed on the market in those cases in which there is an agreement between the manufacturer and the MSA to allow testing at the manufacturer's premises.

Regulation No 548/2014 has a clause in it that empowers MSAs to undertake the verification process at the premises of manufacturer:

Annex III of Regulation No 548/2014 states: "Given the weight and size limitations in the transportation of medium and large power transformers, Member States authorities may decide to undertake the verification procedure at the premises of manufacturers, before they are put into service in their final destination."

The case where portable equipment is brought and operated by an accredited independent lab (mandated by an MSA)

In this case the MSA hires and appoints an accredited independent lab that moves its staff and measuring equipment to the manufacturer's premises where the test is performed.

PROS +

- The market surveillance tests at manufacturer premises could be conducted in sequence with the conformity assessment test of the manufacturer. In this case, the transformer is ready to be tested and with very little effort, the measurement equipment of the manufacturer can be substituted by the measuring equipment of the independent lab for the market surveillance tests.
- Using accredited laboratories provides more accuracy in accordance to the harmonised standards measurements. These measurements could be used to prove non-conformity within a court of law.
- Using independent laboratories guarantees the independence of the market surveillance process.
- Using the manufacturer's premises guarantees higher testing capability in power and size.
- Performing market surveillance tests in sequence with the conformity assessment test of the manufacturer minimizes the risk of delays in the delivery of the transformer to the costumer.

CONS –

- Moderate cost of testing (the testing costs will include the travel costs of the lab staff and the transportation cost of the measuring equipment)
- It is necessary for coordination between the independent lab and the manufacturer to fix the dates of the tests.

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The case where manufacturer's measuring equipment is used (Witness testing with 3rd party assessment)

The transformer is tested at manufacturer's premises with manufacturer's staff and measuring equipment. The test will be witnessed by the staff of an independent lab hired by the MSA to ensure the procedure and tests are correct.

A modification of this testing procedure could entail not only the assessment of the manufacturer measurement equipment and the testing procedures but also the physical calibration of the manufacturer's measuring equipment by the 3rd party experts with their own calibration instruments.

PROS +

- Market surveillance tests at manufacturer premises could be conducted in parallel with the conformity assessment tests of the manufacturer
- All large power transformers are subject to factory acceptance tests (FATs) arranged between the commercial parties prior to the product being granted approval for shipping, these tests can be witnessed by the staff of an independent lab hired by the MSA for market surveillance purposes
- Using the manufacturer's premises guarantees higher testing capability in power and size
- Performing market surveillance tests in parallel with the conformity assessment test of the manufacturer minimizes the risk of delays in the delivery of the transformer to the costumer
- Lowest cost of testing.

CONS −

- It's necessary to coordinate between the staff of the independent lab and the manufacturer to fix the dates of the tests
- Use of non-independent and/or non-accredited premises requires a prior assessment of the measurement equipment and the testing procedures.

  This assessment will comprise at least:
  – Checking of the climatic conditions
  – Checking of the accredited calibration of the measurement equipment of the manufacturer
  – Checking of the installation conditions (load and supply)
- Costs of the calibration of the manufacturer's instruments (if done)
- Due to the risk of performing the test not completely in line with the standard methodology (if the manufacturer's instrumentation is not correctly calibrated and test conditions differ from the harmonized standard), the resulting measurement could be legally questioned for use to prove non-conformity.

In-situ, independent party measuring equipment

This is the most complicated option. It is recommended for use only in the cases where none of the options described previously are feasible (i.e. when the product is already installed, there is a lack of agreement with the manufacturer or end user to conduct testing at the manufacturer's premises, final assembly of the product at transformer installation place, etc.).

The transformer is tested at its place of installation by an independent lab accredited for in-situ testing. The lab will provide its own staff, measuring equipment and power supply.

PROS +

- In-situ testing is the most feasible option for transformers already put into service

CONS −

- In-situ tests are not in accordance with harmonised standards and the Ecodesign regulation (i.e. climatic conditions are hard to attain, the measurement of the losses is likely to be done with reduced power/voltage, etc.)
- The use of independent laboratory mobile testing systems can have limitations in terms of power, voltage, etc.

- Highest costs (the testing cost will include the travel costs of the lab staff and the transportation cost of the measuring equipment and the power supply)
- If the transformer is already in service, halting the installation to perform testing could be complicated and could result in costs for the end user
- Due to the risk of the test not being completely in line with the standard methodology, in-situ tests may produce a measurement that could be legally questioned if being used to prove non-conformity.

Summary of viability of testing options

Conformity verification test results will be indisputably legally enforceable if they are conducted by a 3rd party test laboratory in accordance with standardised test procedures. The same is true if the testing is done at the manufacturer's premises using 3rd party test equipment and staff, or using the manufacturer's equipment for witness testing with 3rd party assessment. Testing in situ may not be sufficient if legally enforceable findings are required because there is currently no harmonised test procedure for in situ testing. In the case of large power transformers testing at the manufacturers premises either using 3rd party test equipment and staff, or via witness testing with 3rd party assessment are likely to be the most viable options as they do not necessitate disruption of the product supply process, the product doesn't have to be transported (at very high cost) to a 3rd party test laboratory and the product does not have to be purchased by the MSA. If the witness testing with 3rd party assessment option is used then it can occur at the same time as the product's Factory Acceptance Test which will minimise costs for all parties. This will also avoid any difficulties in having test facilities of the required capacity to test these very large products. Nonetheless, it requires the MSA to have been notified that the product (to be installed in their jurisdictional territory) has been commissioned in time to arrange to witness the FAT.

4.1.3.3 Final flowchart

The final flowchart setting out the INTAS market surveillance methodology for large power transformers under current circumstances is show in Figure 2 on the next page.

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FIGURE 2

TRANSFORMERS

FINAL FLOWCHART OF THE INTAS METHODOLOGY FOR LARGE POWER TRANSFORMERS

0. GENERAL INFORMATION

- Info on requirements under Ecodesign Directive 2009/125/EC & Commission regulation (EU) No 548/2014 (energy performance, product information and technical documentation)
- Information meetings to market actors, webpages, guidelines, etc.

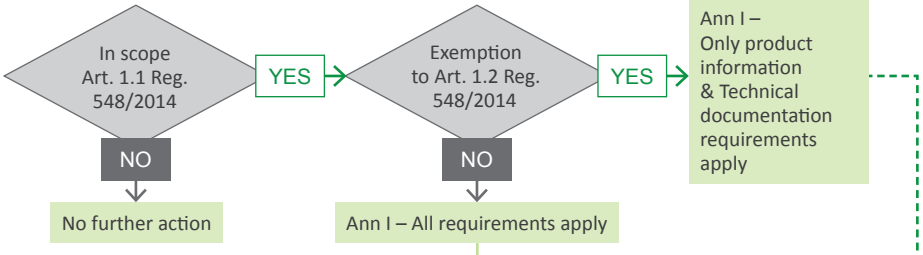
1. PRODUCT SCREENING / SAMPLE SELECTION

A. PRODUCT IDENTIFICATION

- Notification to MSA of new product:
- Prior to placing on the market or making available on the market,
- Post making available on the market and before put in service

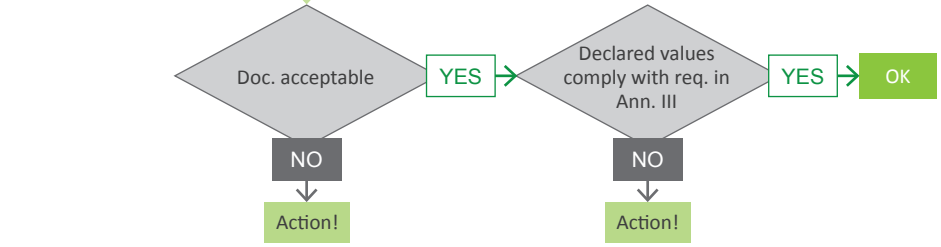
→ (Voluntary) agreement with client, or with supplier for testing at their premises

B. PRODUCT CLASSIFICATION



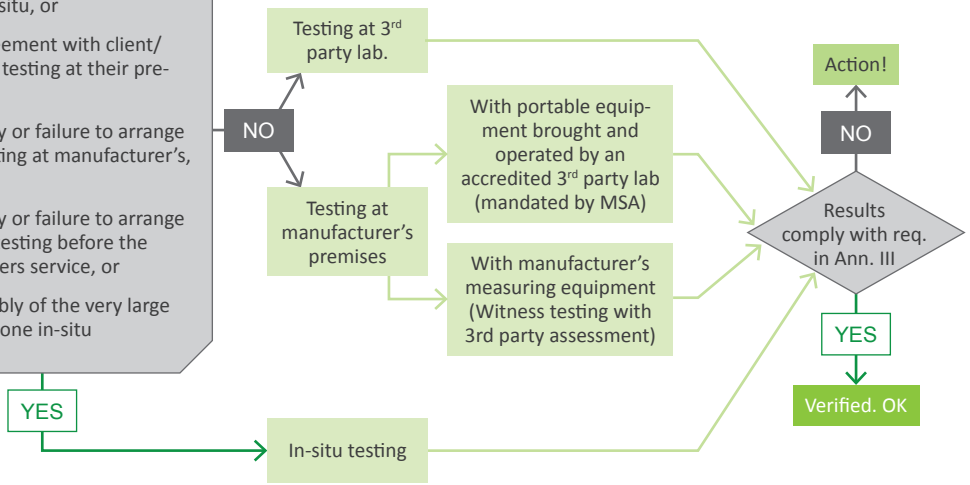
CHECK LIST

2. DOCUMENTATION INSPECTION



3. TESTING

- Manufacturer failed to declare the production (or order) of the product to MSA, and product already installed in-situ, or
- Lack of agreement with client/ supplier for testing at their premises, or
- Impossibility or failure to arrange witness testing at manufacturer's, or
- Impossibility or failure to arrange mobile lab testing before the product enters service, or
- Final assembly of the very large product is done in-situ



KEY

Action! MSA to take action! (model fails to comply)

Req. for trafos exempted in Art. 1

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INTAS

INDUSTRIAL AND TERTIARY PRODUCT TESTING AND APPLICATION OF STANDARDS

TRANSFORMERS FANS

4.2 Methodology under future circumstances

The text below sets out INTAS's recommended methodology for Ecodesign market surveillance authorities to follow to ensure conformity with the requirements for power transformers under future circumstances when it is hoped that the INTAS project recommendations with regard to policy and technical development have been implemented. Essentially the methodology to be applied will be the same as under current circumstances except for the differences explained below.

4.2.1 Mandatory product notification

In the future it is hoped that the Ecodesign regulations will be amended to require mandatory notification to MSA's whenever a large power transformer is to be placed on the market. This will remove the current uncertainty with respect to knowing when a product is placed on the market and will also remove the need for MSAs to set up voluntary informal notification processes as described in section 4.1.1.1.

The precise recommendations are set out in INTAS deliverable 4.4.

4.2.2 Standardisation for on-site testing

The current harmonised standards for power transformer energy performance testing do not include provisions for the conduct of in situ testing – either at the point the transformer is put into service, or at a manufacturers test facilities. Independently of the requirement of product notification that may avoid the need of testing in situ, in the future it is hoped that this situation will be enabled in different circumstances, for example when the mandatory notification is not produced, or when the use of manufacturer premises is not possible for different legal or technical circumstances. This case will be remedied so that in situ testing has an agreed method that produces legally enforceable results.

Standardization committees are invited to develop the methodology to recognize the validity of the in-situ tests and it is recommended that policy makers to include in the Regulation No 548/2014 specific tolerances for verification procedures for this test method.

4.2.3 Testing at manufacturer premises

In principle testing at manufacturer premises (factory acceptance tests (FATs), or testing with independent laboratory equipment) are the most likely means of verifying the large products conformity with the Ecodesign requirements and are permitted within Commission Regulation (EU) No 548/2014. However, it would be helpful were the regulations to confirm that MSA's in jurisdictions where a power transformer is due to be put into service have the authority to require a manufacturer of the product to facilitate such a witness test, regardless of where the manufacturer is located (whether inside, or outside the EU).

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4.2.4 Design calculation assessment

The development of conformity verification methods based on qualified 3rd party assessment of manufacturer's design calculation methodology and declarations are likely to be particularly useful for large power transformers. The INTAS project is informed that power transformer manufacturers routinely use design calculation software to develop transformer designs and to estimate their physical properties, including those related to their energy performance. Establishing mechanisms to validate the software used to ensure that it produces acceptably accurate projections of product energy performance is therefore likely to be a useful additional tool for MSAs to use to raise conformity with regulations. There is a need for both technical development work to develop a set of benchmarks and for regulatory development to require software used for energy performance declaration of large power transformers to be corroborated. There is also potential to enable and require power transformer suppliers to submit design software files for their products on demand so that MSA experts can simulate the performance using the benchmark software to see if the values match the declared values and respect the requirements of Commission Regulation (EU) No 548/2014 or its future iterations. Establishing such a conformity verification pathway would greatly facilitate Ecodesign market surveillance, as it would allow models that are too expensive to be tested at 3rd party laboratories and for which there may be difficulties to participate in witness factory acceptance tests to be controlled and verified and, if linked to a mandatory notification system, would greatly reduce the cost of conducting conformity verification assessments. It is noted that such an approach is already used in the USA for energy performance conformity verification of power transformers and hence the experience there could be examined for its suitability for use in the EU and potentially adapted as required.

4.2.5 Cooperation between MSAs

Besides the already existing cooperation in the frame of ICMS[3] – The EU Information Communication System for Market Surveillance, there is much that MSAs can do to cooperate to facilitate conformity verification actions across the EU. Most pressingly, a mechanism needs to be in place to inform the MSA where a product is due to be put into service when a product has arrived at the point of entry into the EEA (which may not be within the same country as where a product is due to be put into service).

Additionally, MSAs could cooperate by:

- sharing conformity verification findings and economic operator risk profile information
- supporting requests from an MSA based in another EEA jurisdiction to conduct site inspections of a manufacturer based within the requested MSA's jurisdiction
- pooling resources to conduct a more holistic market surveillance process for large power transformers.

[3] Wherein MSAs are already sharing products' market surveillance data and information.

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Abbreviation list

DSO	Distribution System Operator
EC	European Community
EEA	European Economic Area
EPC	Engineering, Procurement and Construction
EU	European Union
EVIA	European Ventilation Industry Association
FAT	Factory Acceptance Test
h	hour
kVA	Kilovolt-Ampere
kW	Kilowatt
m^3	cubic meter
MSA	Market Surveillance Authority
Pa	Pascal
R&D	research and development
TSO	Transmission System Operator
VSD	variable speed drive

List of figures and tables

More information

WEBSITE

about the INTAS project activities and all of its results are published on:
www.INTAS-testing.eu

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DISCLAIMER

INTAS

INDUSTRIAL AND TERTIARY
PRODUCT TESTING AND
APPLICATION OF STANDARDS

METHODOLOGY

TRANSFORMERS

FANS

Project Title	Industrial and tertiary product Testing and Application of Standards
Deliverable Title	Overall methodology for the targeting and compliance verification of fans and transformers
Submission date	December 2018
Lead Beneficiary	WSE
Author(s)	Paul Waide
Dissemination level	PU
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