False Alarms of Fire Detection and Fire Alarm Systems in selected European Countries

Sebastian Festag, Lance Rütimann
Euralarm, Zug, Switzerland

Abstract

Based on the results of a previous project, the Task Group False Alarm of the European electronic fire and security industry association "Euralarm" has reviewed the false alarm data collection methodology of fire detection and fire alarm systems (FDAS) in Germany, Great Britain (England), Switzerland, Sweden and Austria (Vorarlberg). The respective situations have been analysed on the basis of facts collected during the fire services responses to fire alarms – a procedure that is handled by the experts very differently from region to region (even within one country). The respective organisations, institutions and persons responsible for the data collection, processing, maintenance and evaluation have been included into the analysis (as far as possible), so as to achieve an appreciation of the often very specific defined processes as well as get to her meaningfulness in the analysis. The false alarm analysis essentially consists of a) General Procedures, b) Relevant Standards, c) User Terminology, d) Alarm Transmission Connection, e) Alarm Criteria, and as well f) Best Practices for the reduction of false alarms. A key observation is the difference between the examined countries that makes comparisons between the countries quite problematic due to heterogeneous conditions. A view to the European norms would suggest the opposite. The present paper gives an overview of the current state of the work and contains presently unpublished material.

Keywords: Fire alarm, false alarms, unwanted alarm, nuisance, fire statistics, fire detection and fire alarm systems (FDAS), data analysis

Introduction

Euralarm is a European association, representing the electronic fire and security industry and consists of the three sections: Fire, Security and Services. The Task Group False Alarm (TG FAS) exists within the section Fire. This group has been tasked with investigating the false alarm situation of fire detection and fire alarm systems (FDAS) in different

European countries with a focus on facts and the methodologies of false alarms. Based on the results of a previous project (see [1] and [2]), this Task Group has since 2014 analysed the respective country-specific alarm situation (real and false alarms) on the basis of available facts collected by fire services.

There remains a lack of reliable details on the range of the false alarm difficulties and their causes. As a result, the suitable points to define and deploy effective countermeasures are missing. It is the aim of this work to establish a common understanding for the country-specific situation of the false alarm topic of FDAS and underline these with facts. Measures to reduce false alarms have been and continue to be taken, but first we need a better understand and quantify the phenomenon of false fire alarms to say outline the main focus for improvements.

False alarms continue to bind and absorb public and private resources. This has lead certain jurisdictions confronted with public budget cuts to redefine the response procedures of fire safety intervention forces, which can go as far as requiring eye witness verification prior to deployment. This inadvertently leads to delayed responses to real fires, hence increasing the risk on lives and assets.

The principle discussion today is that the number of false alarms should be reduced. This objective must not allow the risk of real fires not being detected in time. In order to consider both aspects, an evaluation basis is required.

Procedure

The present paper on the conducted analyses, so as to understand the specific false alarm situation of FDAS and methodologies, with the aim to derive a common approach to an empirical analysis of fire services data. The analysed material has been recorded and collected by experts during the fire services responses to fire alarms, and was found to be handled very differently from country to country. In the analysis we have reviewed the false alarm data collection methodology of FDAS in Germany (see [3], [4]), Great Britain/England (see [5], [6]), Switzerland [7], Sweden (see [8], [9]) and Austria/Vorarlberg [10] – see [11]; without Austria.

The respective organisations, institutions and persons responsible for the data collection, processing, maintenance and evaluation have been included into the analysis (as far as possible), so as to achieve an appreciation of the often very specific defined processes as well as get to her meaningfulness in the analysis. The false alarm analysis essentially consists of a) General Procedures, b) Relevant Standards, c) User Terminology, d) Alarm Transmission connection, e) Alarm Criteria, and as well f) Best Practices for the reduction of false alarms.

Before the false alarm ratio can be calculated, it is important to note that the available data varies from country to country as well as the data mining approaches. Additionally, a distinction between data from FDAS (commercial applications) and smoke alarm devices (domestic applications) must be made.

In a new approach [3], the following options for calculating the false alarm ratio are given – the choice to use the formulas depends on the availability and validity of the data. These four formulas are as follows:

$FA_1 = x_{FA} = n_{FDAS,FA} / n_{FO}$ Eq.1

Description: ($FA_1 = x_{FA}$) *False alarm ratio based on the number of false alarms from FDAS ($n_{FDAS,FA}$) in relation to the number of all fire fighting operations (all fire alarms, activations; real and non-real fire conditions; n_{FO}) of the fire services and the same time interval (e.g. per year).*

$FA_2 = X_{FA} = n_{FDAS,FA} / n_{FO,B}$ Eq.2

Description: ($FA_2 = X_{FA}$) *False alarm ratio based on the number of false alarms from FDAS in relation to the number of all fire fighting operations (fire alarm activations) in buildings ($n_{FO,B}$) of the fire services and the same time interval.*

$FA_3 = \varphi_{FA} = n_{FDAS,FA} / n_{FDAS,I}$ Eq.3

Description: ($FA_3 = \varphi_{FA}$) *False alarm ratio based on the number of false alarms from FDAS in relation to the number of FDAS ($n_{FDAS,I}$), of the same region, fire services and time interval.*

$FA_4 = \varepsilon_{FA} = n_{FDAS,FA} / n_{FDAS}$ with $n_{FDAS} = n_{FDAS,FA} + n_{FDAS,RF}$ Eq.4

Description: ($FA_4 = \varepsilon_{FA}$) *False alarm ratio based on the number of false alarms from FDAS in relation to the number of all fire alarm activations caused by FDAS (real and non-fire conditions by FDAS; n_{FDAS}), of the same time interval (e.g. per year).*

All formulas require the total number of false alarms from FDAS and at least one absolute number from the reference figures (1-4).

Results (in a summarized form)

The countries Germany, Great Britain (England), Switzerland, Sweden and Austria (Vorarlberg) have been reviewed. The detailed results to the situation in Germany are described in detail [3]. These results have been supplemented with the data from Great Britain (England), Switzerland and Sweden (see [4]). The results from Vorarlberg (Austria) are unpublished till now. The core findings will be summarised in an overall evaluation/assessment of all five countries.

The situations between these countries are not directly comparable, because there are a lot of differences. This begins with the fact that the term for a *fire alarm without a real fire condition* – at the time when the

fire services arrive – varies (in detail, the situation at the time of the alarm may change until the fire services have arrived; that shows how difficult it is to assess). We call a fire alarm without a real fire-condition as false alarm (from the perspective of the fire services). In some countries, it is referred to as an unwanted or unjustified alarm, although objectively the same is meant. It is even more complicated because even within the countries, standardized terms are not consequently used. Fig. 1 and Fig 2 show the definition per country according to the country-specific terms used. It can be seen that the definitions vary in each country, but there are some similarities. In principle, it should be possible to find a common base, without major changes. In most of the countries, a fire alarm without a real fire-condition is called a *false alarm*. The common basis of the categories is to distinguish *equipment failures*, *deceptive alarms* and *intentional and unintentional actions* by persons.

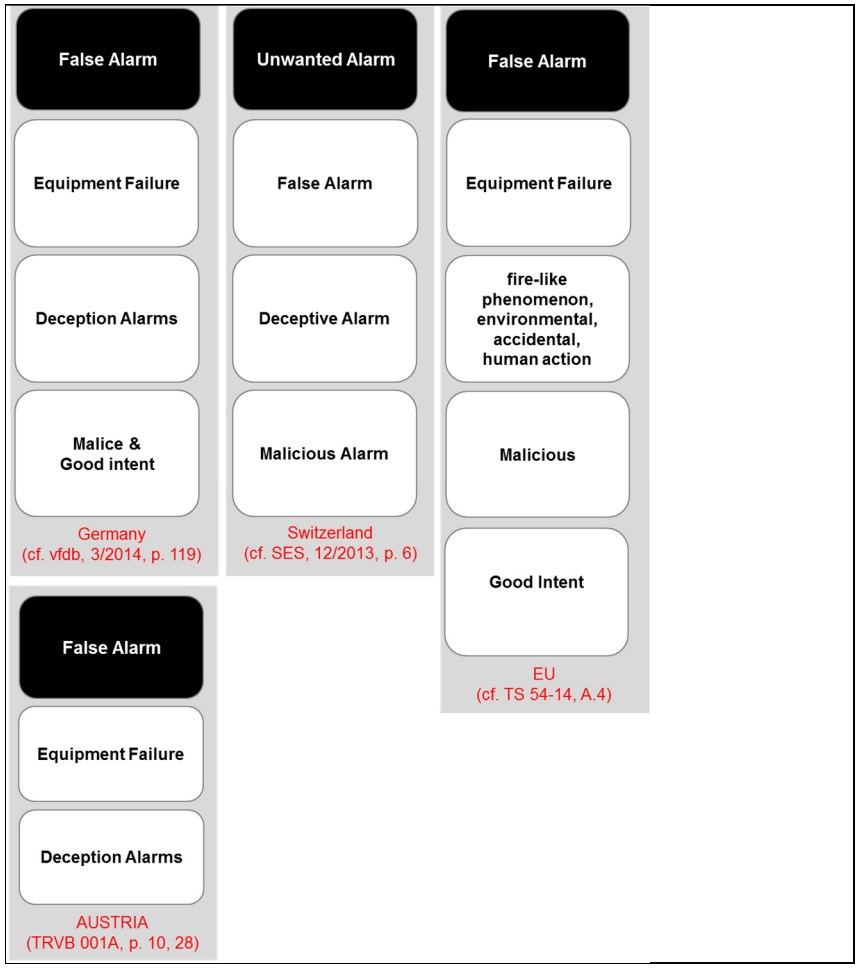

Fig. 1. Overview of the definitions and terms per country [4].

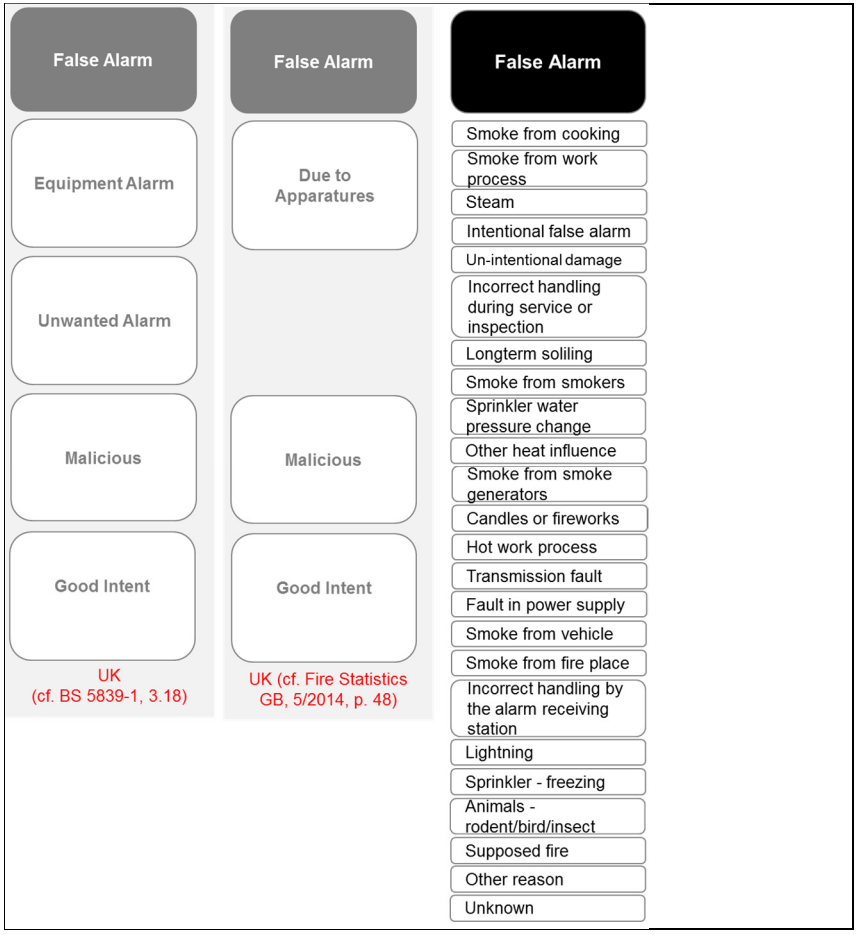

Fig. 2. Overview of the definitions and terms per country [4].

In addition to the terms, the requirements/standards of FDAS vary between the countries. FDAS are used inside buildings and they must meet many requirements. The requirements are described in standards. In general, we have to differentiate between product and application standards. If the components of FDAS meet the product requirements according to EN 54-series, and this is certified by a notified body, they can be provided with a CE mark and freely traded in the European Economic Area (and EFTA). With this, a standardized use of products is given. In addition to the product requirements, FDAS are subject to application requirements. These national standards represent the "state of the art" and define the minimum requirements to be met in the design and operation process of FDAS. The national requirements vary. In short: Despite using the same products or components, there is a lack of comparability between the system technologies of the same type in different EU countries owing to the various application standards and

philosophies of each country. Table 1 gives a summarized overview of the false alarm situation in each country analyzed.

Table 1. Summary of the false alarm situation in countries analyzed.

	Standards	**Terminology**	**Alarm Transmission Connection**	**FA ratio**
DE	**Product standards:** DIN EN 54-series **Application standards:** DIN 14675, DIN VDE 0833-series, VdS 2095, VdS 3178, CPR	No standardized use; false alarm with subcategories	Most FDAS (approx. 90 %) are connected automatically to fire services	FA_1 = 36% FA_2 = 66% FA_3 = 74% FA_4 = 86%
GB	**Product standards:** BS EN 54-series **Application standards:** BS 5839-1, (Non Domestic) , BAFE 203, CPR	No standardized use; false alarm with subcategories	Mostly ARC verifies the alarm.	FA_1= 38%
CH	**Product standards:** (EN 54-series) Swiss Fire Protection Directive, Cantonal Building Insurers, Trade	Standardized use; unwanted alarm with subcategories	Most FDAS (approx. 90 %) are connected automatically to fire services and approx. 10 % are connected to an ARC.	FA_3 = 61% FA_4 = 88%
SE	**Product standards:** EN 54-series, SS3654 **Application standards:** SBF110 from Swedish Fire Protection assoc.	No standardized use; false alarm with 25 criteria	Most FDAS are connected automatically to fire services	FA_2 = 66-76% FA_3 = 57% FA_4 = 90-95%
AT	**Product standards:** EN 54-series, **Application standards:** TRVB 123, TRVB 151	No standardized use; False alarms are divided into equipment failures and deceptive alarms	Most FDAS are connected automatically to fire services	FA_1 = 52% FA_2 = 83% FA_3 = 123% FA_4 = 92%

Legend: DE=Germany, GB=Great Britain (England), CH=Switzerland, SE=Sweden, AT=Austria / Vorarlberg

Comparisons between FDAS from different countries are made more difficult by different ways of the alarm transmission connection between the FDAS to the fire services according to the national standards. In Germany, Switzerland and Sweden, most FDAS are connected directly to the fire services. In England, most FDAS are routed to the fire services through an ARC, which verifies the alarm.

Considering all of this, of course, in the different countries, we found a different quality and quantity of data material and statistics about false alarms from FDAS. These values show similarities, but they are not suitable for a direct comparison.

Conclusion and outlook

It is not easy to differentiate between real and false alarms because it is not easy to say at which point we are talking about a real fire. The situation can change between the initial alarm and the arrival of the fire and rescue services. Additionally, it is not clear whether a term has the same meaning in two different countries. The characteristic values of FDAS such as the false alarm ratio cannot simply be applied from one country to another. Amongst other reasons, is that: a) a standardized European way of collecting and documenting the data does not exist – often not even in one country, b) a standardized use of terms is not given and c) the national application standards differ – and with that, the components of an alerting process.

A common understanding of real and false fire alarms is needed, and a common framework for false alarms with comparable categories or criteria – similar as we have roughly applied in this report. As a next step, a common basis of the term false alarm should be agreed. This term is already used in this way in some countries and it is also used in European standards. A definition of the categories can be reconsidered at a later date. A uniform approach for documentation and preparation of data/statistics is imperative for this subject.

Fundamental research activities are needed to get reliable facts. There are a lot of questions considering that real and false alarms are not on a same quality level: How many false alarms do we have? How can this be assessed quantitatively and qualitatively? When will we have more false alarms than we want to accept? Are false alarms in principle a side-effect of fire detection? How many real alarms do we have from FDAS? What are the effects of real and false alarms? Which technical approaches are helpful for a reliable and fast fire alarm combined with a view to false alarms?

Basically, we see that the subject of false alarms must be increasingly implemented and integrated into the fire protection and fire alarm strategies. Handling false alarms is an active part of the management of a site.

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