ProAuthent

Integrated protection against counterfeiting in mechanical engineering through marking and authenticating critical components

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1 Introduction

The current OECD study of counterfeiting and piracy shows an enormous increase of the value of world-wide seizures from 1999 to 2005 ([OECD-08] p. 72). In Germany, VDMA [1] estimates the loss in sales in the Mechanical Engineering branch caused by counterfeiting to amount to up to €7 billion per year. In the related survey, 68% of the participating companies reported being affected by counterfeiting and piracy [VDMA-08].

Despite the coverage of the issue in public, politics and economics, effective methods and fully developed technologies for the protection of products remain elusive. Development and installation of supervision along the entire value added chain from the supplier to the customer as a core technique is particularly urgent. ([Wil-07] p. 8, 62 - 77)

The main objective of the doctoral research and development project ProAuthent [2] is to fight counterfeiting of critical components and spare parts in Mechanical Engineering through integrated protection by marking and authenticating products at selected points in the value added chain.

2 Research objectives and methodology

The research objective is to develop a framework to:

1. Identify critical parts and components in a manufacturing company
2. Select a suitable marking technology for parts and components
3. Mark particular parts and components
4. Design and implement a distributed IT-system to track and trace marked products within the value added chain

2.1 Identification of critical parts and components in a manufacturing company

In a company threatened by counterfeiting and piracy, adding security markings to every manufactured part and component to always be able to recognize them as original can be ineffective and cumbersome, because marking and later checking each single product is always associated with additional expenses. Therefore, it is necessary to directly identify the parts which are most in danger of being counterfeited and are also of special interest to the original manufacturer. By examining counterfeiters' motives and comparing this to the manufacturer's priorities, specific aspects can be determined as relevant criteria for selecting the components requiring protection. These are products with a high margin, sales figures, and research, development, and know-how intensity as well as successful products with unique selling points. Additionally security relevance, functional relevance, the risk of damage to the manufacturer's reputation, and linked services can be regarded (Figure 1).

[1] Verband Deutscher Maschinen- und Anlagenbau e.V.

[2] This research and development project is funded by the German Federal Ministry of Education and Research (BMBF) within the Framework Concept "Research for Tomorrow's Production" and managed by the Project Management Agency Forschungszentrum Karlsruhe (PTKA).
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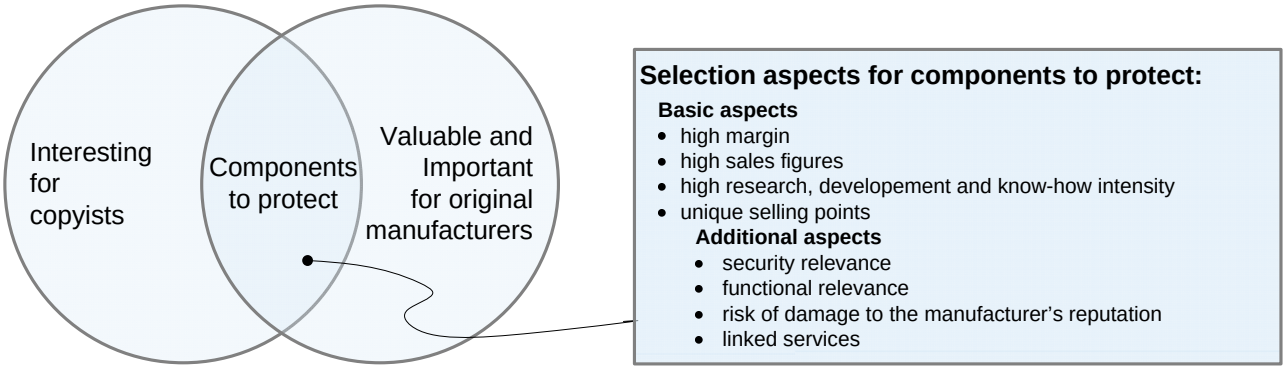

Figure 1 Aspects for the selection of components to protect (basic and additional)

2.2 Selection of a suitable marking technology for parts and components

After the parts and components to be protected are identified, it is necessary to select a suitable marking technology for each of them. This requires knowledge of existing security marking technologies. A broad search for technologies as part of the research project lead to a catalogue of 39 technologies and their particular special characteristics. These characteristics formed the basis to identify the best fit according to the requirements of the components to be protected.

In the special cases that were part of the research project the best technologies were holograms, infrared colors (IR), copy detection patterns (CDP) and radio frequency identification (RFID). The first two technologies are denoted as originality marking technologies and the second two as unique marking technologies.

The complete procedure for identifying parts to be protected and the suitable marking technology is described in a general guide.

2.3 Marking particular parts and components

According to the international chamber of commerce ([ICC-06] p.9) the applied markings must be

i. impossible to copy or replicate
ii. durable for the period of product use
iii. impossible to remove.

In order to guarantee ii and iii for the selected parts and technologies, the goal is to always have the markings as an integral part of the components and to apply the mark during the manufacturing process. CDP or RFID (under certain conditions) are inherently impossible to copy or replicate. Holograms and IR are technologies for less expensive products that are weaker against replication.

2.4 Design and implementation of a distributed IT-system to track and trace marked products within the value added chain

As mentioned in paragraph 1, tracking and tracing marked parts is an effective technique to combat counterfeiting. This requires designing and implementing a distributed IT-system (Figure 2). The identity of parts with worldwide unique markings can be read by a user at every identification point and stored together with the location and time stamp in a central data base.

In the case of RFID, the marking is a transponder carrying the electronic product code (EPC) and the unique tag id (UID) according to the worldwide standards of EPCglobal [3] ([EPC-08], [EPC-07]) and ISO [ISO-09]. These data can be read out at each identification point and stored in the central data base to show the path of every single part; making it possible to check the originality of a part by comparing the read out data with the stored data at any time.

Additional components and spare parts are particularly affected by counterfeit and piracy in the Mechanical Engineering sector [VDMA-08]. To support a customer running a machine, suitable readers can be in-

[3] EPCglobal is leading the development of industry-driven standards for the Electronic Product Code™ (EPC) to support the use of Radio Frequency Identification (RFID) in today's fast-moving, information rich, trading networks. [EPC-10]

stalled as an identification point inside of the machine to verify that in the machine only contains original components. This leads to significant advantages for the machine owner, because he or she can be sure of the quality and functionality of the original parts and doesn't risk losing the machine's warranty.

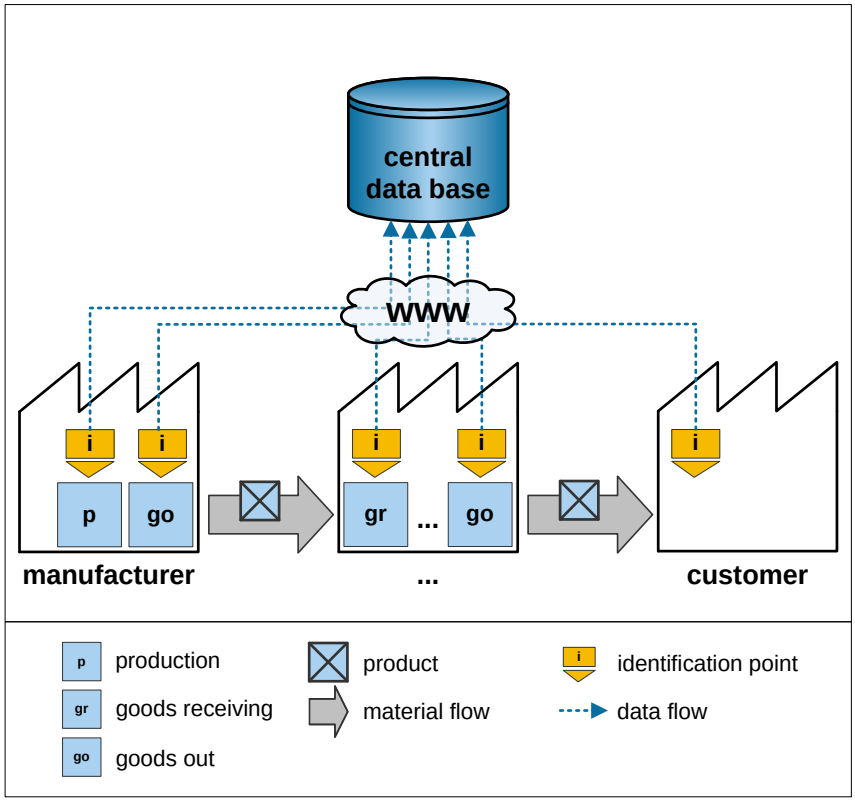

Figure 2 Secure tracking and tracing within the value added chain

To expand the described tracking and tracing system to other technologies, such as CDP, it is only necessary to encrypt an EPC into the CDP and to install the readers at selected identification points. With the originality marking technologies, tracking and tracing are based on the uniqueness of the marking- making system integration is more difficult to realize. However, in that case, checking of the originality of a marking would surely be possible.

3 Expected results

At the end of the research project, a functional and holistic system to fight counterfeiting of parts and components in Mechanical Engineering will be realized. The system will monitor a product's path along the entire value added chain in order to detect false parts at least by the point of installation in the machine. For that reason, a combination of tracking and tracing-functionalities and automatic authentication of parts and components inside the machine holds comprehensive anti-counterfeiting potential. The system will integrate several technologies to mark and recognize original products (RFID, CDP, IR, hologram, etc.) while leaving the possibility open to add further technologies at any time.

Further results are the complete procedure to identify parts to be protected and the suitable marking technology as well as a catalogue of existing marking technologies and their characteristics.

4 List of references

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