ProAuthent
Integrated Protection against Counterfeiting in Mechanical Engineering through Marking and Authenticating Critical Components

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ELA Doctorate Workshop

fml - Lehrstuhl für Fördertechnik Materialfluss Logistik
Prof. Dr.-Ing. Dipl.-Wi.-Ing. W. A. Günthner
Technische Universität München
1. Product Piracy in Mechanical Engineering

2. Integrated Protection System
   2.1 At-Risk Components
   2.2 Fraud-Resistant Features and Originality Check
   2.3 Check Results and Documentation

3. Summary
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1. Product Piracy in Mechanical Engineering

Global Impact

- International trade with fake and illicitly copied products 2005: $200 billion per year

  Containing only goods of cross-border trading, no fakes/copies in national trade or internet distributed products

- Actual volume could equate to several hundred billion US$ more

Volume of Goods assured by Customs [Mio US $]

Number of Countries Reporting to the OECD

Source: [OECD-08]
1. Product Piracy in Mechanical Engineering

Impact on Mechanical Engineering in Germany

- Economical damage due to product piracy: €7 billion per year
- 68% of German mechanical engineering enterprises are affected

Direct economical damages
- Loss of sales and profit
- Expenses for protection measures, registration and assertion of trademark rights and patents

Indirect economical damages
- Damage to reputation
- Sinking price level
- Product liability
- Loss of know-how

Estimated Loss in Sales at Affected Companies 2007

Source: [VDMA-08]
Distinguishing between Originals and Counterfeits

• **High product quality – no longer a measure for product authenticity:** Differences between original product and counterfeits are often hardly noticeable for customers

• **Meaning to expanded supply chains and sales networks:** Challenge of communicating to all participants differentiating features

→ **Trademark protection approach:** Product protection by marking with fraud resistant features for sustainable (manual) authentication

Source: Aktionskreis gegen Produkt- und Markenpiraterie e.V. (APM)
Supply Chain Surveillance

- Simple supply and logistics structures become complex supply and logistic networks

- Tracing one’s own products along the supply chain and discovering counterfeits, illicit sales etc. becomes uncontrollable without qualified systems

Logistics approach:
Applying tracking and tracing functions based on databases which store information about the serialized product’s progress through the logistics chain

Source: [GS1-10]
1. Product Piracy in Mechanical Engineering

Anti-Counterfeiting for Components and Spare Parts in Mechanical Engineering

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<th>Trademark protection approach:</th>
<th>Logistics approach:</th>
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<td>Marking with fraud resistant features</td>
<td>Tracking and Tracing</td>
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<td>Availability of information about the components’ Authenticity solely on-site</td>
<td>Implementation of an area-wide online data comparison system necessary</td>
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Efficient protection system against product piracy for mechanical engineering?

Research project **ProAuthent** funded by The Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung)
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2. Integrated Protection System

Research project ProAuthent

- Secure protection against counterfeiting
- Integrated protection within products and supply chain
- Additional customer’s benefit
- Integration of different partners
- Marking, Identification, Tracking & Tracing
- Proven technical solution
- Integration into existing IT-systems
- Conformity to the judicial framework
- Additional customer’s benefit

Technische Universität München

ProAuthent

HOMAG  MÜLLER MARTINI
infoman  MULTIVAC
schreiner ProSecure
VOLLER

Bundesministerium für Bildung und Forschung

ProAuthent - Lehrstuhl für Fördertechnik Materialfluss Logistik · Prof. Dr.-Ing. Dipl.-Wi.-Ing. W. A. Günthner · Technische Universität München
2.1 At-Risk Components

- Marking every component with fraud resistant features and checking authenticity is cumbersome.
- Cost-benefit ratio prohibits marking every component.

Criteria for the selection of components to protect must be developed.

![Diagram with components to protect and criteria]

**Components to protect**
- Valuable and important for original manufacturers
- Appealing to counterfeiters

**Basis aspects**
- High margin
- High sales figures
- High research, development and know-how intensity
- Unique selling points

**Additional aspects**
- Security relevance
- Functional relevance
- Risk of damage to manufacturer’s reputation
- Linked services
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2.2 Fraud-Resistant Features and Originality Check

Analysis of the trademark protection market
More than 15 companies with more than 80 security products

22 marking technologies out of 40 usable in mechanical engineering

Choice of security marks

Selection criteria
• Information stored inside the marking feature
• Accessibility for checking
• Acceptable complexity and cost for checking
• Required automation level of the checking procedure
• Available infrastructure
2.2 Fraud-Resistant Features and Originality Check

Selected marking technologies

The following four marking technologies are realized in a demonstration system and will be realized in industrial pilot installations:

- Secure on-site authentication (offline)
- Information transfer in central data base for transparency along the SC
- IR color pigments
- Copy detection pattern
- RFID

Not with simple hardware

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<th>IR color pigments</th>
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<th>RFID</th>
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<td><img src="#" alt="Hologram" /></td>
<td><img src="#" alt="IR color pigments" /></td>
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Via manual input
2.2 Fraud-Resistant Features and Originality Check

RFID: Authentication Mechanism with Cryptographic Signature for Offline-Authentication

Online-Authentication

- Electronic Product Code (EPC): easily reproducible
- Unique tag ID (UID): written in the read-only-memory of the chip, reproduction very expensive and complex
  → Security level using UID is very high

Offline-Authentication

- EPC + UID are signed by the manufacturer
- EPC and signature of a tag can only be copied to transponders with same UID
  → Secure mechanism applicable in mechanical engineering
Fraud-Resistant Features and Originality Check

RFID: Authentication Mechanism with Cryptographic Signature for Offline-Authentication

Manufacturer

- Private key for encryption
- EPC, tag ID, signature
- Generation of the signature on the basis of EPC and UID

Point of Authentication

- Public key for decryption
- EPC, tag ID, signature
- Decryption of the signature
- Comparison with EPC and tag ID for originality check

Documentation

Central Database
complete data set

WWW
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Data Transfer from every Point of Authentication to Central Database

Offers customers, retailers and manufacturers various possibilities for data analysis and additional benefits (condition monitoring, customers classification etc.)
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Functions of the ProAuthent-System

Basic Functions:

✓ Marking of “at-risk” parts and components with fraud resistant features to distinguish between originals and counterfeits

✓ Possibility of a secure on-site authentication (offline) for different marking technologies to be sure of the originality

✓ Possibility to transfer checking results to the central data base

Functions of tracking and tracing:

✓ Tracing of products along the supply chain with different authentication points to protect it against counterfeits

✓ Protection of machines

✓ Increasing the transparency along the SC

✓ Documentation in the central database for subsequent traceability
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Thanks a lot! Questions?
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