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Smart Manufacturing Technique to Curb Counterfeit of Products

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Abstract: ***In a world of rapidly developing technology, the world of automation is taking leaps. The number of innovative products and devices coming out of the market are uncountable. But at the same time the counterfeit of such products is also a market which is also booming. In this paper, our main objective is to curb the entry of counterfeit products into the market by "a Laser engraved QR code containing a randomly generated Ki number linked to each product key on the product and perform unique verification steps to compare the product key on the product and product key obtained as OTP from the manufacturer website". This method will be effective to identify and sell the genuine products to the customer and also to identify the seller of counterfeit products. As a result from our proposal, the entire losses to the manufacturers owing to the counterfeit market is substantially reduced and ensures quality product sold to the customers.***
Keywords: Smart manufacturing, counterfeit products, Industrial 4.0, QR code engraving, Internet of things.

I. INTRODUCTION

To "counterfeit" means to imitate something. Counterfeit products are fakes or unauthorized replicas of the real product. Counterfeit products are often produced with the intent to take advantage of the superior value of the imitated product. They tend to have fake company logos and brands have a reputation for being lower quality leading to catastrophic failure in their operation resulting in various accidents causing immense losses to both customer and the manufacturer.

II. INCIDENTS DUE TO COUNTERFEIT PRODUCTS

One such incident owing to the counterfeit products as obtained from "Live leak dated 3rd Jan 2010" which states that the Partnair Flight 394 was a Chartered flight which crashed on 8 September 1989 off the coast of Denmark 18 km north of Hirtshals. All 50 passengers and 5 crew members on board the aircraft perished, making it the deadliest civilian aviation accident involving an all-Norwegian airline company. It was also the highest death toll of any aviation accident involving a Convair 580, and the biggest airplane accident in Denmark. The Investigators found the three of the four bolts on the tail wing that were not replaced were counterfeit parts and were incorrectly heat-treated during manufacture. These three fake bolts each could bear only about 60% of their intended strength, making them less than practical to use on the aircraft. The fake bolts wore down excessively, causing the tail to vibrate resulting in loss of control of the flight and leading to a fatal accident.

III.REVIEW OF STATUS OF RESEARCH AND DEVELOPMENT IN THE SUBJECT

A number of companies involved in the development of anti-counterfeiting and brand protection solutions have come together to form special industry-wide and global organizations dedicated to combating the so-called "brand pirates" such as the International Hologram Manufacturers Association. Other companies and organizations have also established web-based communities that provide a framework for crowd-sourced solutions to counterfeiting. To help distinguish the originals from the counterfeits, the copyright holder also employs the use of serial numbers or hologram etc., Inspite of all such technologies the counterfeit market is at large and impact due to the selling of products is still substantial.

IV. IMPORTANCE OF THE PROPOSED PROJECT IN THE CONTEXT OF CURRENT STATUS

A few simple statements for anyone involved in the purchase of products are the genuinity of the product sold and whether id the counterfeit products can be identified. Moreover just a few disastrous customer experiences could be critical to the manufacturer's very existence. "The drawback of the current method to identify the counterfeit products especially in the automobile industry is that all the details are printed on the product packaging. The product packaging once removed eliminated all the safety and security of the product and it can be easily recreated as the product as such does not have any special markings or engravings as given in its packaging". This gives the opportunity to easily replicate the naked product when it is out of its highly secured packaging. These few questions engaged us to draft an idea to eliminate counterfeit products using smart manufacturing technique.

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V. METHODOLOGY

Our proposal involves the implementation of laser engraving technique, QR scanning processes and unique verification procedures using IOT and other subsequent steps.

VI. PROPOSED SYSTEM IDEA

Our idea in a nutshell is to create a randomly generated Ki number which will be converted into a QR Code by a QR Code generator.

A. This QR Code carrying the Ki number will be engraved by a fibre laser engraving machine controlled through PLC and input information from an Onsite HMI.
B. In our proposal, the product should contain an engraved QR code and the Product key on the surface of the produce and each product key is individually linked to each Ki number.
C. When a random customer decided to buy the product, the following steps will be carried out one by one.
D. Customer scans the QR Code using a QR Scanner. The individual Ki Number for the respective product key are stored in the man
E. The Ki Number in the QR Code will direct the customer to the Website of the product manufacturer and the minimal details of the customer will be collected.
F. like procedure is carried out where the Product key is sent as a message to the customer. The customer shall now verify the product key on the product and in the message received.
G. If they both match then the verification process is done and the product is genuine and it is registered to the respective customer.
H. If the product key is not similar, then it is concluded that the product in hand is not genuine.
I. These are procedural steps of our proposal idea through which a genuine product is successfully sold to a buyer and the counterfeit product is also identified.

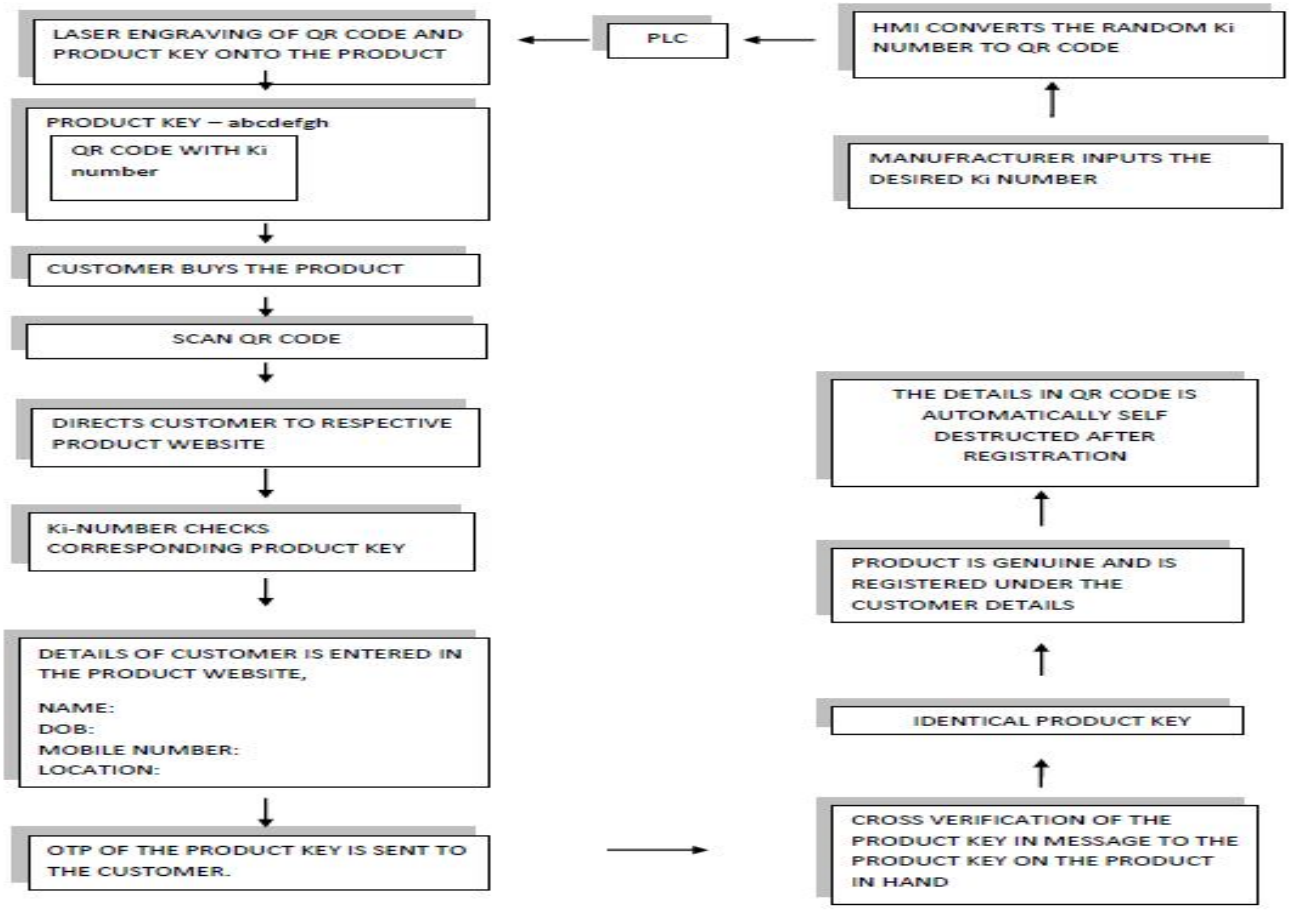


Figure 1.The schematic of the proposed system.

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VII.SIGNIFICANT ROLE OF QR CODE

QR code (Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed for the automotive industry in Japan.A QR code consists of black squares arranged in a square grid on a white background, which can be read by an imaging device such as a camera, and processed using Reed–Solomon error correction until the image can be appropriately interpreted. The required data is then extracted from patterns that are present in both horizontal and vertical components of the image.

VIII.QR CODE ENGRAVING METHOD

The laser engraving machine instalment can be considered as a onetime investment by the manufacturer to implement the proposal to curb counterfeit products. Compared with inkjet coding, laser marking has many advantages. Firstly, it is a permanent identification method, which cannot be modified. Secondly, it does not require consumables which reduce the use of cost. Thirdly, it is environment friendly with fewer emissions. With the increasingly strict requirements of product quality tracking, laser marking obtains a wide range of applications.

IX.PRECISE VERFICATION PROCEDURE

Once the necessary information is gathered from the customer. An OTP (one-time password) and like method is integrated a message is sent to the mobile number of the customer. The Product key of the respective product is sent as the OTP to the customer. Through this method the customer can verify the product key he has received in the message to the product key which is engraved on the product.

A. If both the product keys are same then the product bought is genuine.
B. If the product key does not match the product key on the product then it is declared as counterfeit or fake manufactured product.
C. As a final step in our proposal the Ki Number gets self-destructed when the product key to which it is linked is registered in the manufacturer server.

X.USER TRANSPRANCY

Through our method the customer is given the opportunity to directly verify the trueness of the product which he is going to buy. The customer can register a complaint or can enquire as soon as it is found that the product key on the product as the product key in the message received is not identical. This gives immense transparency in the authentication process and the customer is well warned if the product is fake or genuine.

XI.RESULTS

The outcome expected from our proposal are listed below,

A. Since the Ki number is a unique number and it is not disclosed to the customer, it cannot be recreated and copied. Even when the QR code is replicated along with the Ki number in it. The Ki Number will not lead to respective product manufacturer site
B. Even on certain cases if the manufacturer website is reached through the replicated QR code. The website shall display a message “this product is already registered under the respective customer details”.
C. Once the QR code is scanned on an already purchased product it will displayed the “already registered message”.
D. When the person behind the counterfeit product tried to register in the manufacturer website, initially his details are collected and prior to that the “Already the product is registered under respective customer “is made to display and the registration fails. This gives us the opportunity to get the details of the person who tried to counterfeit the product.
E. In our proposal since the QR code containing the Ki number is only a one time scan able code, repeated scanning of the same QR code will not disclose any information.

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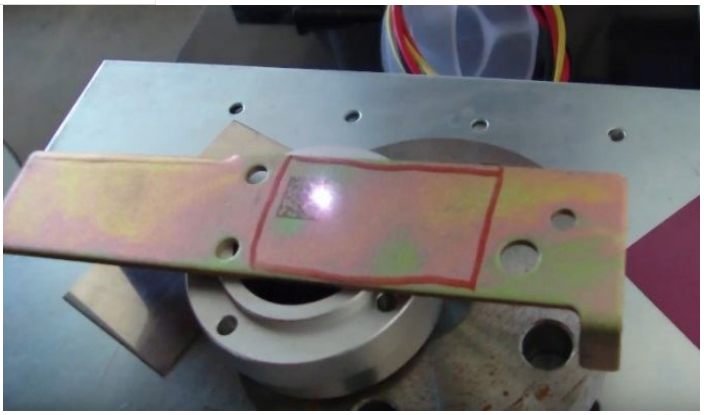


Figure 2.Laser QR engraving process on metal plate



Figure 3. QR code engraved metal plate



Figure 4. Example of QR code generated information when registration of the same product.

Figure 4.Shows that subsequent registration of the same product under different customer ID is eliminated. The total losses to the manufacturer due to selling of counterfeit products are drastically reduced. The genuine products alone will be sold to the customer through our verification process. The selling of cheap fake products affects the name of the brand, through our method the name of the brand is kept protected. Our proposal is simple but yet implements the existing Ki number and QR code concept into a system where counterfeit product can be easily identified and recreation of the genuine products can be greatly reduced.

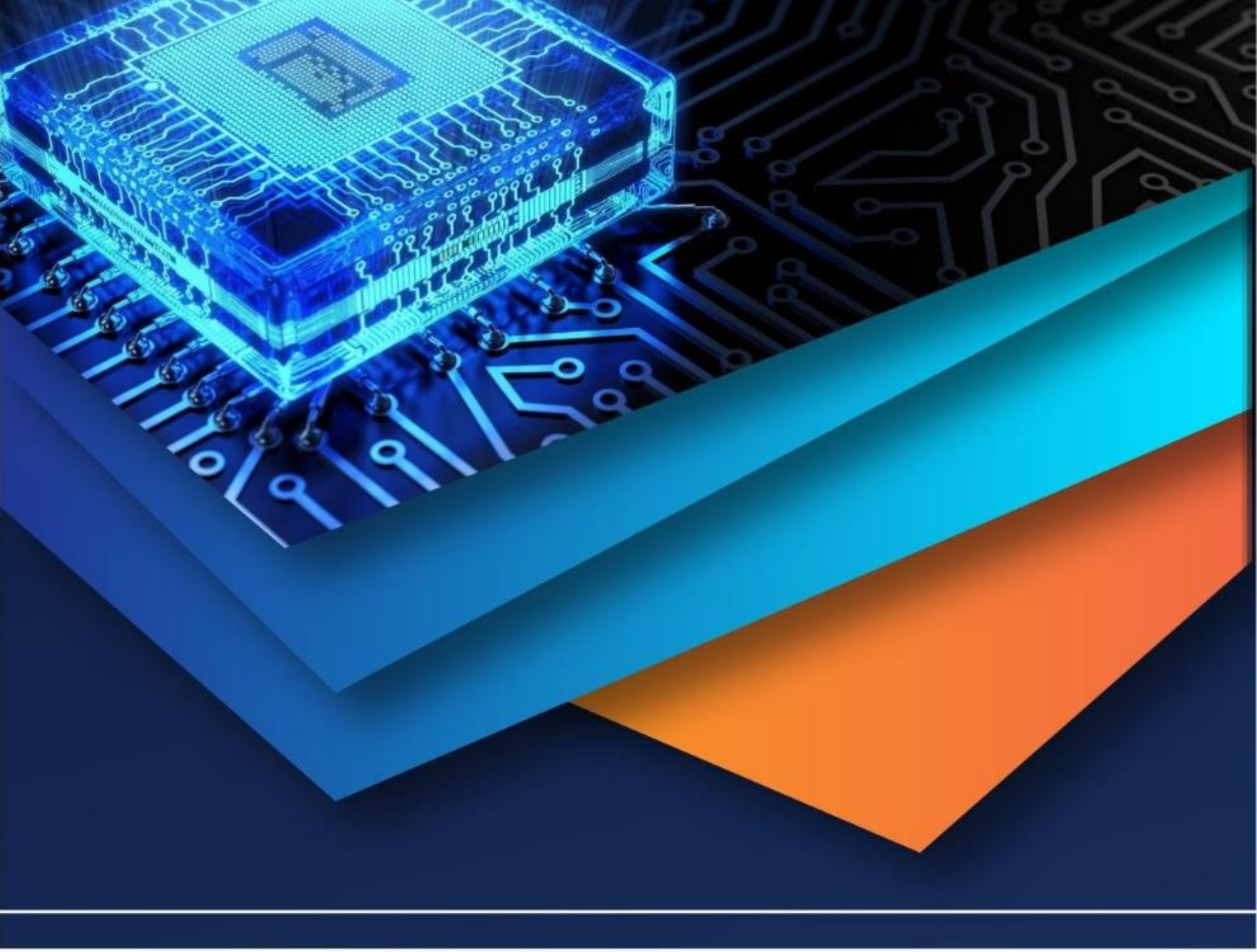
XII.CONCLUSION

The rapid increase in worldwide counterfeiting over the last few decades is definite cause for concern. Counterfeit products represent a significant cost for all parties in the supply chain, and unreliable, low-quality products can expose consumers to potential safety hazards, resulting in loss of revenue, brand value, and reputation, as well as exposure to investigations and legal actions. Owing to the theme of "innovative solution for smart manufacturing" Our proposal is both smart and can be an integral part in every product from the production line. Finally, a safer manufacturing and selling process to eliminate counterfeit is proposed wherein the concept of customer interaction directly with the product registration and verification of trueness plays a key role in identifying counterfeit products. This method will greatly benefit the manufacturer and the customer and owing to this method the market of fake product production will greatly reduce.

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