PASSIVE

RFID TECHNOLOGY

DIGITIZES THE ENTIRE PRODUCT LIFE CYCLE

AEG ID Develops Life Cycle Model for Products with 12 Phases

Passive RFID transponders can be operational for 20 to 30 years, depending on their design. Products that are already tagged with a passive RFID transponder at the factory therefore generate numerous advantages for manufacturers, logisticians, vendors and consumers over the entire life cycle. "These products, which are already tagged during manufacture, will become the norm in the future," explains Simon Arch, Marketing & Sales Director at AEG Identifikationssysteme GmbH (AEG ID).

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AEG ID's 12-phase model describes phases in the lifecycle of products in which passive RFID transponders are used and where they generate benefits for the manufacturer or end user.

The '12-Phase Model' – A Product of Chance?

The development of the RFID transponder lifecycle model was prompted by several influences. Customer demand changed: instead of asking for help with a dedicated identification issue, customers turned to AEG ID with multiple concerns at different stages of production. "The realization that the technology could be used in upstream or downstream production steps often came very quickly when we talked to them," recalls Simon Arch.

Climate Balance and Circularity Reflections

The realignment of AEG ID as a sustainable company with a positive carbon footprint was another motivating factor. In 2019, AEG ID engaged an external sustainability consul-tancy to help it achieve a more holistic and sustainable focus for the company. Lifecycle diagrams are common in such analyses. "In the process, we noticed," recalls Simon Arch, "that such a lifecycle diagram, with the addition of a few points, is congruent with the lifecycle of an RFID transponder in a product." The idea of offering RFID transponders specifically for all life phases of a product was born.

Result: The 12 Stations for a Product

The lifecycle of a product begins with the raw material and the manufacture of the individual components of the product. Ideally, the passive RFID transponder is integrated into the raw material at this stage so that the serial numbers (IDs) are already available before the product is created. Based on the number of IDs, logistics are planned and production is prepared. In the third step, the production itself is planned; information for the CAM system is stored on the transponder. Before final assembly can take place, some of the individual components may have to be stored temporarily. Often, manufacturing steps also take place in another production facility, which is mapped in the production logistics phase. Final assembly then takes place, followed by product testing. Product requirements regarding documentation are taken into account in the packaging. The product then leaves the production facility. Once it reaches the customer, the RFID transpon-der can be used for specific applications. The information stored on it is used for tamper-evidence, anti-counterfeiting and maintenance. At the end of its life, the product is recycled or disposed of. The transponder, which could be used during the entire life of the product, is removed beforehand if possible, or is recycled or disposed of together with the product.

The 6 Main Phases from Production Preparation to Recycling

The first three phases of the model can be reasonably grouped together as 'preparation'. This is followed by the 'logistics' phase. Final assembly or 'production' remains independent. This is followed by the 'sales' phase and, in turn, by the phase of 'use' of the product by the customer, including technical inspection. This is by far the longest phase in the life cycle of a product. At the end is the 'recycling' of the product.

Sustainability and the Circular Model

The product lifecycle model suggests that the end of life of a product is at least partly the basis for manufacturing a new product. This is becoming increasingly easy to implement. Many materials can be ground into granules, which in turn are used to make new components. RFID transponders can be ground along with these processes or destroyed and filtered out later.

PASSIVE RFID TECHNOLOGY

Passive RFID transponders are battery-free. They draw their energy for data transmission from the electromagnetic field of the reader. They do not function without a reader. They have a service life of 20 years or more.

In addition to the manufacture, use and recycling of a product, several intermediate phases can be defined in which RFID transponders provide support.

1. RAW- / BASEMATERIAL

Individual components are manufactured; the transponders are integrated or applied in the process. The identification numbers (IDs) of the installed transponders are transmitted.

2. LOGISTICS and PRODUCTION PLANNING

The number of IDs is equal to the number of components. With these key figures, the manufacturer plans the logistics and prepares the production.

3. PRODUCTION

The work sequence of the machine production is planned. Specifics such as torque and speed, material selection and milling programs are stored in the ERP system under the ID.

4. STORAGE / WAREHOUSE

Under certain circumstances, an intermediate storage of individual components is necessary. The ERP system is involved in controlling this process.

5. EXTERNAL PRODUCTIONLOGISTICS

First production steps, possibly in production facilities that are distant from each other. The RFID transponder enables track & trace in intermediate logistics.

6. FINAL ASSEMBLY / TEST, QUALITY

The product is finished and tested. The test and its result are stored on the chip.
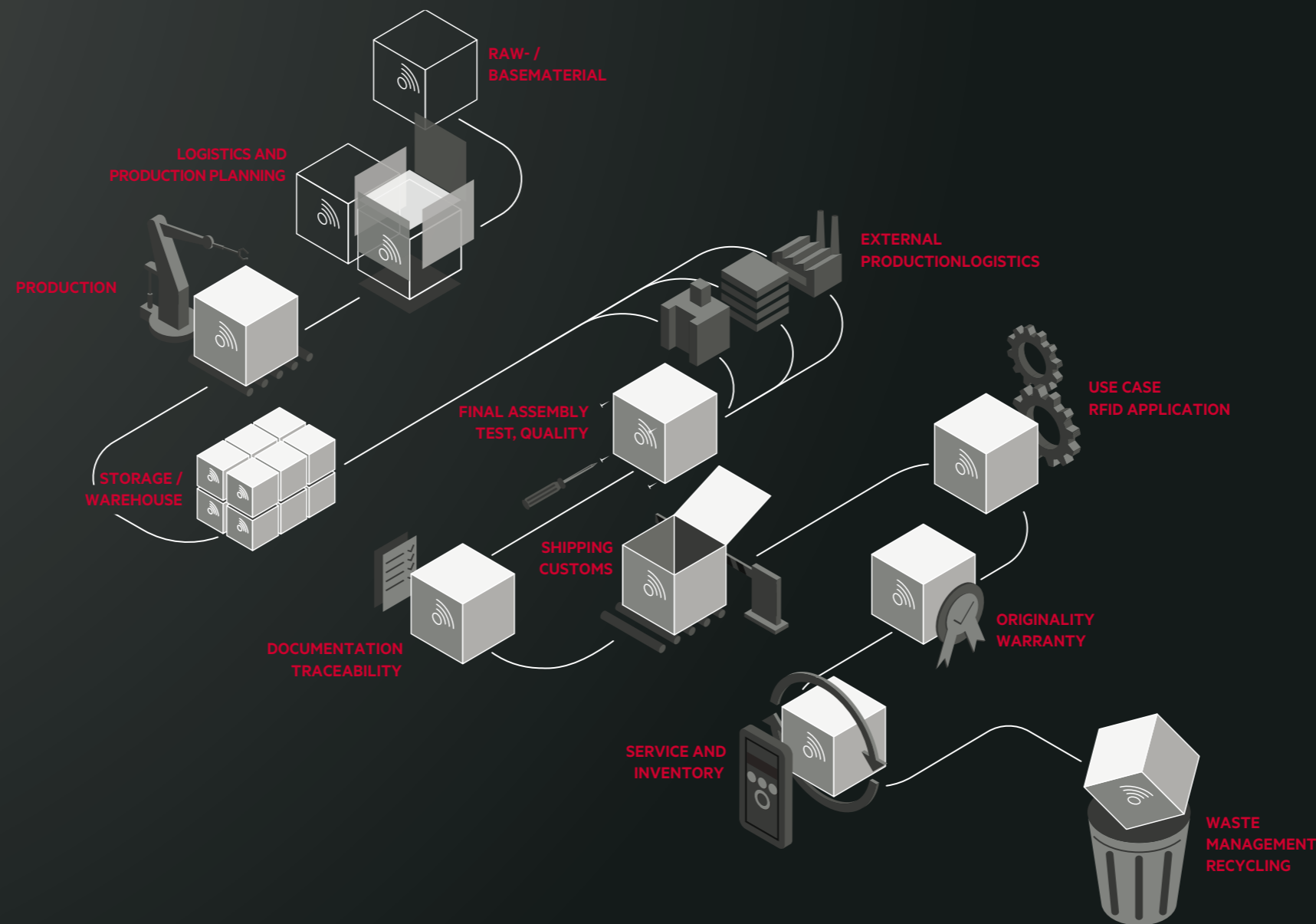
7. DOCUMENTATION / TRACEABILITY

RFID transponders are used during packaging to ensure that the product is accompanied by operating instructions and other important documents.

8. SHIPPING / CUSTOMS

The loaded products leave the plant. The load number and recipient are recorded. Customs can access the data on the transponder.

9. USE CASE / RFID APPLICATION

Customers use the tagged product. In some circumstances, the transponder was integrated mainly for use in the field.

10. ORIGINALITY / WARRANTY

The originality of the product and anti-counterfeiting are guaranteed by the transponder.

11. SERVICE and INVENTORY

Relevant information for technical inspections is obtained from the transponder; the maintenance and inspection history is stored in the transponder.

12. WASTE MANAGEMENT / RECYCLING

At the end of the product's service life, the product is disposed of or recycled. If possible, the transponder is removed beforehand or recycled with it.

RAW- / BASEMATERIAL
LOGISTICS AND PRODUCTION PLANNING
PRODUCTION
EXTERNAL PRODUCTIONLOGISTICS
STORAGE / WAREHOUSE
FINAL ASSEMBLY TEST, QUALITY
USE CASE RFID APPLICATION
SHIPPING CUSTOMS
DOCUMENTATION TRACEABILITY
ORIGINALITY WARRANTY
SERVICE AND INVENTORY
WASTE MANAGEMENT / RECYCLING

▶ Simon Arch
Marketing & Sales Director
AEG Identification Systems GmbH

"AN END-TO-END SOLUTION FOR EVERY PHASE OF THE PRODUCT'S LIFE"

AEG ID's product lifecycle model breaks down the 12 phases in which RFID transponders can be used and can generate benefits. RFID & Wireless IoT Global interviewed Simon Arch, Marketing & Sales Director at AEG Identifikationssysteme GmbH, about the 12-phase model.

1. Mr. Arch, what has been your experience in dealing with your customers when it comes to integrating RFID technology straight into the product?

Simon Arch: Typically, it is the case that one or two departments come forward with an identification challenge and then the realiza-tion comes that the technology can certainly be used in other areas. On the one hand, it enables better documentation, better logistics, a precise product history that can be created. The last point in particular is a great advantage that quickly convinces other departments. On the other hand, customers with new projects have often already developed this idea themselves. They either already use RFID or it is clear that an end-to-end solution is needed for every phase of the product's life cycle. What then becomes extremely important is consulting on integration in the product and in the subsequent processes, i.e. reading or writing in the individual life stages. This must then be considered holistically.

2. Compared to five years ago, how would you describe the interest and also the speed of customers in integrating RFID?

Arch: Five years ago, there was less know-how on the part of customers on the subject of RFID. Since then, a lot has been done within the industry, so that the topic is now better known. Many customers have become pre-informed, especially at trade shows such as the Wireless IoT Tomorrow, which takes place once a year. The other important factor is that in the past, it was more common to get point-in-time requests when customers had a problem at a particular point. Now, we are seeing more and more of a move in the direction of managers looking at the complete production area, rather than just one situation or one challenge. This has changed. It has also become clear to those responsible that, although the investment comes from one department, the entire company benefits from it.

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3. How many conversations do you have before a project is started and how long is this initiation period?

Arch: That depends on the product itself. Depending on the framework conditions such as high temperatures, mechanical stresses and so forth, it may take more meetings and on-site appointments to implement a project. The initiation period can last from quick solutions within four to five phone calls to several months. The time required for integration also depends on how many cycle phases we cover with the solution and whether field tests at the customer's site are desired.

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4. How many phases of the lifecycle are generally covered?

Arch: Of the 12, sometimes three are covered, and sometimes seven. For each point of the cycle, you have to investigate what you need for it separately. The requirements are quite different. If I go into the raw materials area, there might be a transponder incorporated at high temperatures and pressure. In the warehouse, on the other hand, there are no stresses of a mechanical nature or due to temperature. We look at all the general conditions and then find the right product in terms of design and frequency. Should a bulk capture take place? Should it be captured individually? These are all points that we go through with a question and project catalog to see whether we can use a standard product or whether customer-specific adaptations are necessary on the transponder side and for the readers.

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5. Are most of your customers familiar with RFID?

Arch: Not all, but some of our prospects have been using RFID for a long time. Unfortunately, this then often means that the transponders and the frequency of the installed solution do not match the previous or next stage in the life cycle. We always approach the acquisition of the initial situation with an open mind and get to the bottom of everything. If, in the course of the installation, an increasing number of areas are then added and further adjustments have to be made little by little - which is often the case - we are then of course thrilled, however, in this case, the installation would take longer overall.

6. What does AEG ID's customer base look like? Are they mostly regular customers or are you constantly gaining new customers?

Arch: They are typically new customers, because these projects are, after all, products that are being developed and are new to the market. We also have existing products, of course, so that a new product generation is then added. However, it is often new customers who have found us as a reference and approach us because we have expertise in transponders and readers.

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7. If you compare which sector you think is more affected by change right now, would it be industrial manufacturing or logistics?

Arch: The industrial sector is growing faster in terms of numbers. In logistics, it is often the packaging that is tagged with transponders and not the products themselves. The application is always the same. In industry, on the other hand, where products are manufactured, each application is different. When I integrate transponders into products, I have to look at each product and project individually. In terms of the number of projects, this is more important for us. We are also not a label manufacturer, so labels for boxes are not one of our core competencies.

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8. Do you have a bestseller?

Arch: The bestsellers for us are glass and disc transponders, simply in terms of their design. They are very good in terms of resistance to extreme temperatures and water, i.e. with respect to IP protection classes. You can actually integrate them anywhere and "throw them in" without anything happening, even in project steps where the housing is produced.

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9. Passive or active – can you comment on this?

Arch: Predestined for the topic are of course passive transponders, because the lifetime of the products exceeds what you can achieve with an active transponder. With a battery or if I have to guarantee a power supply, then I am not able to get by with active transponders. For this reason, almost 100% of the products and capital goods are passive systems. The transponders are integrated or built into the production process and are then always accessible.

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10. What importance do you attribute to other wireless technologies such as UWB, LoRaWAN or BLE?

Arch: My answer has to do with lifetime and cost. If the transponders are integrated in the product, then they are only of interest to the manufacturer, not to the end customer. For this reason, I consider the other technologies to be of little importance in this respect. They tend to have their justification in process-intensive applications, but typically not in integration in products per se.

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11. Is UWB also a topic of interest for AEG ID?

Arch: Yes, of course. We are already looking into this in our development departments. At present, there is no series product in this area that we manufacture in volume. We tend to use them in combination. However, we are currently concentrating on passive RFID transponder systems and the associated readers.