Letters to the Editor

RFiD Threads® Technology for Circular Economy and Future Sustainability

Anura Rathnayake, PhD
Founder and Chairman of Adetexs Group
19 Park Lane Business Centre, Park Lane, Nottingham, United Kingdom, NG6 0DW

Web: www.adetexs.com

Problem

The fashion industry is the second most polluting industry globally [UNEP2021] - 85% of all textiles go to landfill each year [WEF2021]. There is growing demand for a shift to circular business models, with new concepts emerging such as "extended producer responsibility" [DEFRA2022], and policy announcements such as the EU Strategy for Sustainable and Circular Textiles, mandating Digital Product Passports (DPP) [EC2023].

The Ellen McArthur Foundation [EMF2021] has stated that "Sustainability concerns among customers are also projected to heighten". This fact, coupled with the preparation of potential new regulatory instruments such as 'Extended Producer Responsibility' and other critical regulatory developments, is pushing the industry to consider different and more sustainable ways of producing textile products. A new technology-infrastructure to facilitate this transition is required, to support companies and consumers access critical data on individual garments.

150 billion items of clothing are produced annually worldwide [EMF2022], of which around 12.5 billion were tagged in 2022, using radiofrequency identification (RFID) technology [Checkpoint2022]. The use of RFID tags is increasing rapidly, with the market projected to reach $35.6 Billion by 2030 [MarketsAndMarkets2022].

However, there are mainly two sustainability related problems holding back the full potential of RFID in the fashion industry:

1. Weaknesses in current RFID-tag technologies: low robustness, non-washability, and attachment to temporary labels not integrated with the garment itself. 12.5 Billion RFID-tags were used last year in the fashion industry, mainly for inventory management [Checkpoint2022]. Those billions of paper/metal/label tags are usually removed immediately after sale and end up in landfill (which is very bad for the environment), because they are not washable or comfortable to wear with the garment. For garments to be traceable throughout their lifecycle (enabling efficiencies and circular models), there is a need for integrating permanent 'Digital Passports' (e.g. RFID) in each textile-based product, and for easy access to data contained in these Digital Passports.

*Correspondence: anu@adetexs.com

2. Lack of data access, exchange and integration between supply chain actors: Currently, stakeholders use their own independent data management system/s. Therefore, the biggest challenges for efficient recycling/reuse of clothing is lack of access to data on fibre/material content. This makes it very difficult to implement automated systems for breaking up and separating used clothing items into their different fibre components.

Solution: UK-based Adetex.ID Ltd (Web Link) has developed, patented and initially validated with leading brands a robust and washable RFID-tag, in the form of a thread which can be integrated easily into any garment. This allows textile-based products to be identified and traced automatically along the supply chain, connecting the physical with the digital world. This 'RFiD Thread®' is the only tag today which is washable (100+ times washing at 60C & tumble-drying test), flexible, strong, and can be integrated into textile-based products invisibly (initially validated in pilot tests with customers including Decathlon and Tommy Hilfiger (customer feedback video link)). This washable 'RFiD-Thread®' is integrated into each product at the manufacturing point, with a unique number and product information (Digital Passport). After shipment, industry stakeholders can easily update our cloud-based system (that has developed by Australian based Adetex.cs Ltd Web link) with the location of the textile product along the supply chain - with automated data sharing to our cloud-based system via RFID scanners. Existing software solutions based on QR/bar codes can be combined with our platform based on RFiD-Threads, to allow access to data by consumers (with QR- code-reading smartphones) as well as industry stakeholders. This means each textile-based product has a traceable life story, with product history stored under a unique number in our cloud-based system (based on blockchain technology for decentralisation and immutability benefits). Sri Lankan based Adetex.Lanka Ltd manufacture the RFiD thread®.

Level of disruption: In addition to replacing current RFID-tags in current markets (inventory management, self-checkout), RFiD-Threads could create new markets across the supply chain: garment production management systems, evidencing ethical/sustainable provenance, consumer entertainment (magic mirror), smart washing machines/wardrobes/irons, reuse (renting, second-hand sales, peer to peer sharing), laundry management, recycling, anti-theft, anti-counterfeit etc. As the RFiD thread® withstands high temperatures and pressure, it can be used for polymer industry including tires for traceability and circular economy. Moreover, RFiD thread® can be used in livestock management, medical/hospital industry, schools, and general goods inventory management.

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