Feasibility assessment of manufacturer-controlled spare parts manufacturing using AM technology:

A case-study in vacuum cleaners

Challenge

The overarching challenge posed by the growing amount of electronic and electrical waste (WEEE), which reached an estimated of 10.5 kg per EU inhabitant in 2020 (Eurparl, 2023), has necessitated the introduction of the "Right to Repair". This measure mandates companies to extend their support for spare parts for up to 10 years after the guarantee period, with a maximum time of 15 days.

Facing an increased supply chain management challenge, companies are turning to Additive Manufacturing (AM) for solutions. AM streamlines supply chains and enables localized, on-demand production, while allowing for a digitalized inventory.

However, there is a first step required, as it to understand the potential of AM within each product portfolio. Therefore:

MRQ: How can componeitns elegibility for AM spare aprts be ssesed?

Research

Trought a literature review, three main areas of eligibility assessment are define: Printability (Suitability of components to be AM printed), Priority for repair (components key for life extension) and Spare Parts suitability (components suitability for AM manufacturing as spare parts).

These main areas shape the proposed eligibility evaluation framework, which aims to identify and prioritize components suitable for AM based on the three areas identified.

To test the framework, we used it in a real-world study involving Philips SpeedPro and SpeedPro Max vacuum cleaners. The results showed that the framework effectively helps companies choose which components to focus on while resulting in

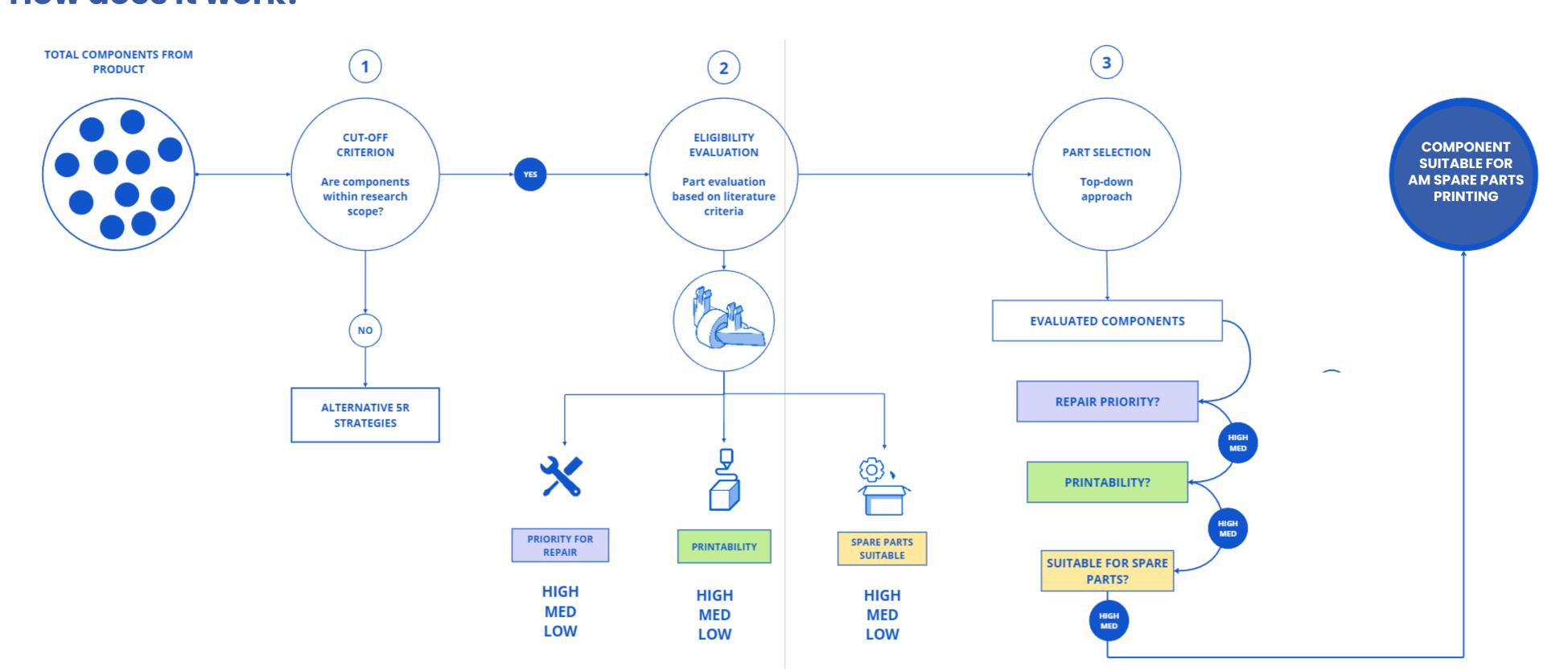


Image: Vortex Airflow test

Proposed elegibility evaluation framework

| PART DESCRIPTION | | | PRINTABILITY | | | | | | | | | | | | SPARE PARTS SUITABILITY | | | | | | | | REPAIR PRIORITY | | | | | | |
|---------------------|-----------------------------|--------------|-------------------------|-----------------------|---------------------|----------------------------------|----------------------|----------|----------|-------------|-------------------|-----------------|--------------|---------------------|----------------------------|----------------------|---------------------------|----------|-------------------|------------------------|------------------|-----------------------|--------------------|--------------------------|--------------------------|----|------|---------------------------------|----------------------|
| ASSEMBLY | REPLACEMENT AVAILABILITY | PRINTABILITY | PART FIT REQUIREMENT | COMPLEXITY OF FORM | COMPLEX CAVITIES | DIFFICULTY GEOMETRY | STRENGTH | FLEXIBLE | ABRASION | TRANSPARENT | SMOOTH SURFACE | FINE DETAILS | HIGH TEMP | WATER RESISTANCE | SPARE PARTS SUITABILITY | SHARED COMPONENT? | DEMAND VOLUME UNITS | VOLUIVIE | PART VALUE (E) | PART VALUE(H ML) | MIN SKU UNITS | MIN STOCK LEVEL | REPAIR PRIORITY | STANDALONE SPARE PART | FUNCTIONAL IMPORTANCE | | | COST OF REPLACEMENT (HML) | ELIGIBILITY SCORE |
| EXAMPLE | | | MOVING PART | SIMPLE GEOMETR * | NO * | 3-MAIN BODY ++FEAT URES | HIGH >85 ▼ MPA | NO ¥ | NO 🕶 | NO 🔻 | NO * | NO * | NO * | NO ~ | | YES ▼ | 50 | HIGH | 50 | HIGH | 50 | HIGH | | YES | HIGH | 50 | HIGH | HIGH | NO |
| EXAMPLE | | | NORMAL FIT | CURVED * | YES * | 1-SINGL E BODY | MED 30 -85 | YES ▼ | YES 🔻 | YES 🔻 | YES ▼ | YES * | YES • | YES ▼ | | NO 🕶 | 30 | MED | 30 | MED | 30 | MED | | NO | MED | 30 | MED | MED | YES |
| EXAMPLE | | | MOVING PART | SIMPLE GEOMETR * | NO * | 3-MAIN BODY ++FEAT URES | HIGH >85 ▼ MPA | NO ¥ | NO ¥ | NO * | NO * | NO * | NO ¥ | NO * | | YES ▼ | 20 | MED | 20 | MED | 20 | MED | | NO | MED | 20 | MED | MED | YES |
| EXAMPLE | | | NORMAL | CURVED ▼ | YES ▼ | 1-SINGL E BODY | MED 30 -85 | YES ▼ | YES 🔻 | YES * | YES ▼ | YES ▼ | YES ▼ | YES ▼ | | NO * | 10 | LOW | 10 | LOW | 10 | LOW | | YES | LOW | 10 | LOW | LOW | NO |

How does it work?



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