

Materials selection for food processing professional appliances

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RESEARCH FIELD

Professional appliances are characterized by an **intense use in harsh environments**; therefore, they need to communicate, through materials sensorial attributes, **robustness** and **reliability**. During their lifetime, professional appliances face specific chemical compatibility problems related to daily contact with **food chemicals** and **detergent compounds** compliance, and to misuse practices.

For this reason, they are developed on one hand through a **performance driven technical design process**, and on the other through a **sensorial-oriented materials selection**, to improve the user experience with the product.



MATERIALS AND METHODS

The research focuses on the integration of **durability** and **sensorial properties** in the **materials selection method** applied to **professional appliances**.

ISSUE 1 - Durability properties of materials

- Nominal information by softwares, databases and handbooks allow quick preventive selection:
>> **need for numerical parameter.**
- Professional **food processing appliances** characterized by **the interaction** among **used material** and different **chemicals**:
 - **detergents** (acid or alkaline base and surfactants);
 - **food chemicals** (oils and fats, sodium chlorides, carbon residuals).
 >> **failure mechanisms, shortening or extension of components' service life.**
- Materials-chemicals interaction influenced also by additional parameters:
 - **temperature** and **pressure**.
- Collaboration with company's experts: **non-traditional methods** in **life-testing** to **simulate appliances use** and assess **materials reliability in time** [2].
- DOE approach [4] to optimize experimental set up and correlate failures.

ISSUE 2 - Sensorial properties of materials

- Case study-based research**
- Professional products communicate through materials sensorial properties: **high quality, robustness, strength, reliability, and easy cleanability**.
>> **reference material: stainless steel.**
- Tools to compare and quantify sensory preferences** of users between different materials (e.g., **polymers, metals**).
>> **readaptation of "Napping® Test"** [7] to translate sensorial properties in a numerical system (e.g., **numerical ranking, material sensory profile**).
>> **descriptors** related to **visual** and **tactile** sensorial properties [5] [6].
>> **panel group: R&D, Design, Quality, chefs and design students.**
- Evaluation of **change in perception** after materials' aging [8].

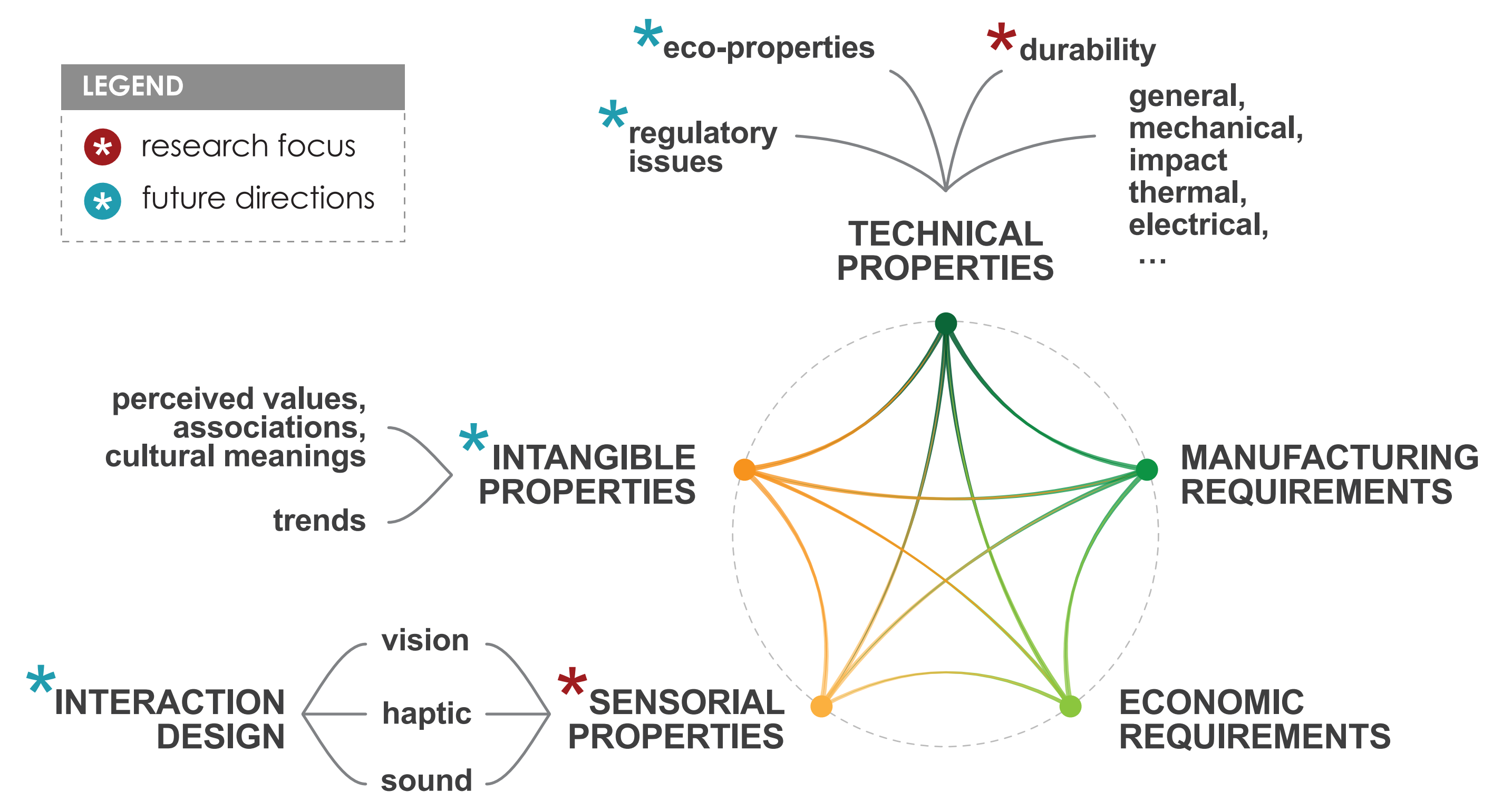
CONCLUSIONS

- Development of a **holistic approach to materials selection**;
- New approach specifically designed for **food processing professional appliances**;
- Common language to **designers** and **engineers**;
- Comparison of qualitative and quantitative** properties of materials, with a focus on **durability** and **sensorial** properties;
- New approach tested on specific case studies
>> further insights for the **development of new products**.
- New opportunities for the company** to show its competences on the market through products ready to demonstrate:
 - high product's performances and reliability;
 - environmental requirements;
 - market trends;
 - compliance with user-product interaction needs.

AIM OF THE RESEARCH

The research aim is the implementation of a **flexible materials selection process**, applied to professional food processing products, able to **couple qualitative and quantitative properties of materials**.

The new materials selection approach evaluates **five macro-categories** of material properties: **technical properties**, **manufacturing** and **economic** requirements, **sensorial** and **intangible properties** of materials.



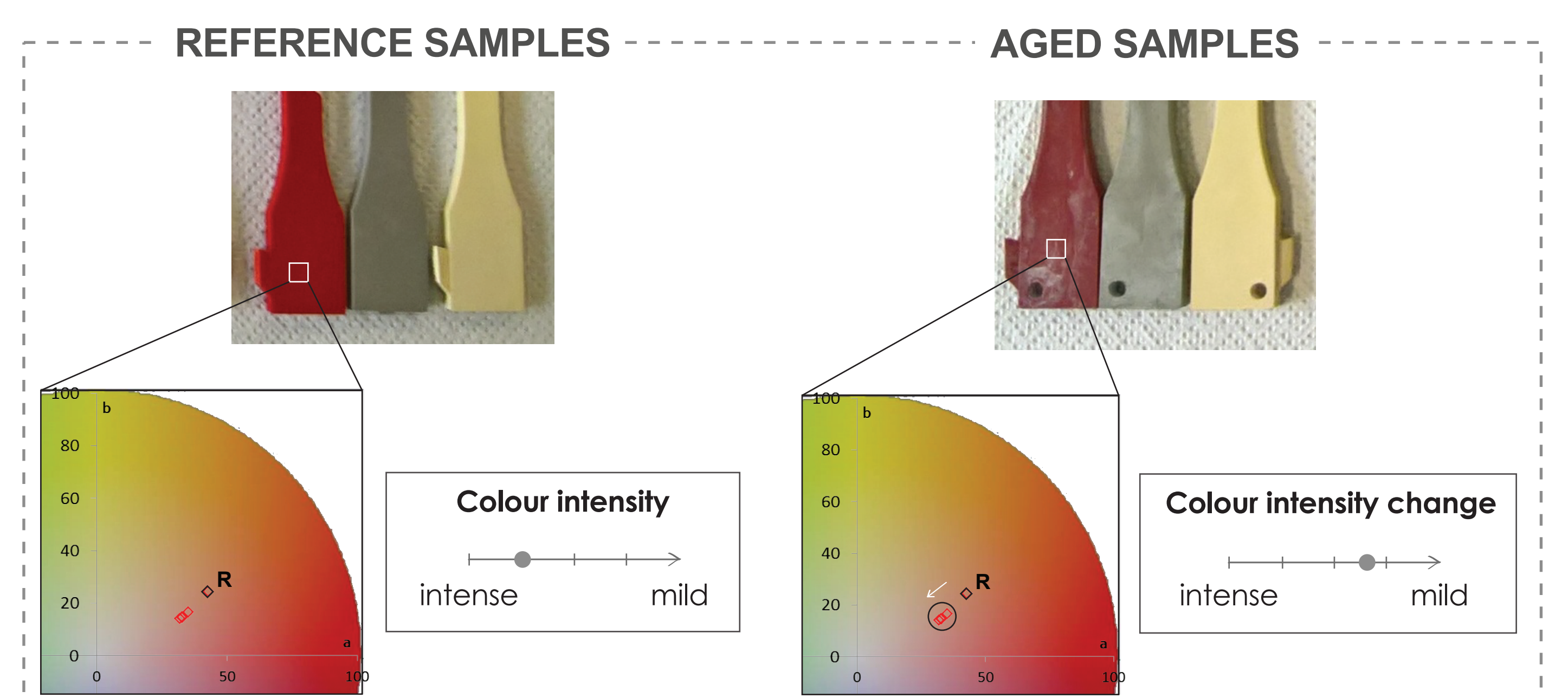
RESULTS AND DISCUSSION

MATERIAL PROPERTIES	DURABILITY	SENSORIAL
METHOD	Accelerated Life-Tests	"Napping® Test" readaptation
MOTIVATION	Simulation of working environment 	Sensorial attributes/perceptions evaluation
OUTPUT	Performance change	Descriptors ranking Material Sensory Profile

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Materials aging*

Aged materials* samples evaluation

Evaluation of sensorial properties changes due to materials aging



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