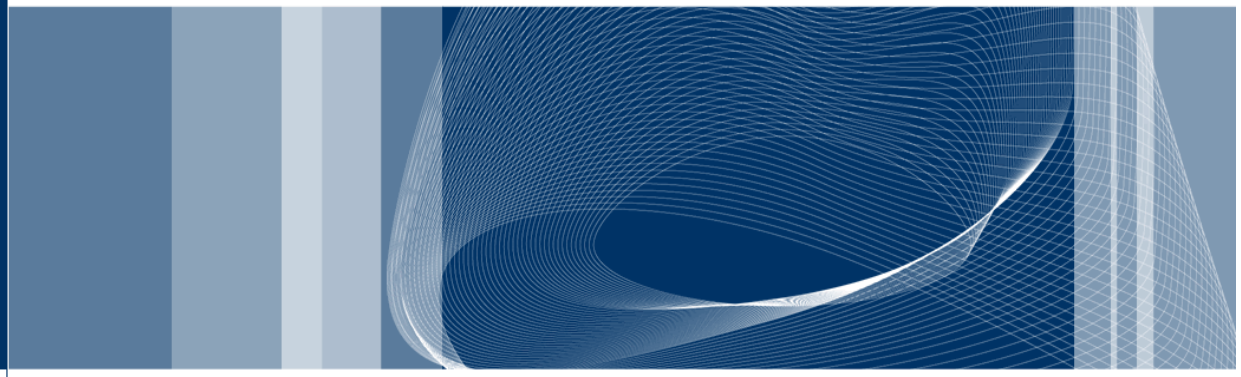
KAEMaRT

Knowledge Aided Engineering, Manufacturing and Related Technologies

POLITECNICO DI MILANO

12ª GIORNATA DELL'ECONOMIA

UNIONCAMERE



EVOLUTIONARY POTENTIAL OF DOMESTIC OVENS

I Laboratori per il cambiamento della Camera di Commercio di Treviso

Camera di Commercio Treviso

Il Laboratorio della Camera di Commercio di Treviso
Treviso Chamber of Commerce Lab

Camera di Commercio Treviso

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FOR M A T

WHY
do we need to know the future?

- Support R&D decisions involving competences and manufacturing technologies in the field of domestic ovens (to keep competitivity in the following subsystems)
  - Aesthetic elements (handle, knobs, visible surfaces);
  - Automation systems (door-lock, tray automation, cleaning actuators).

FOR M A T

WHAT
do we need to know about the future?

- To what extent will the functionality of high range domestic ovens change for what concerns:
  - Programmability
  - Cooking modes
  - Automation

  in Europe, until 2025?

- What are the expected changes in high range domestic ovens concerning materials and finishing having an impact on
  - Aesthetics
  - Tactile feeling
  - Image
  - Functionality

  of external surfaces, in line with design and interaction trends, in Europe, until 2025?

FORMAT

HOW
do we plan to learn about future?

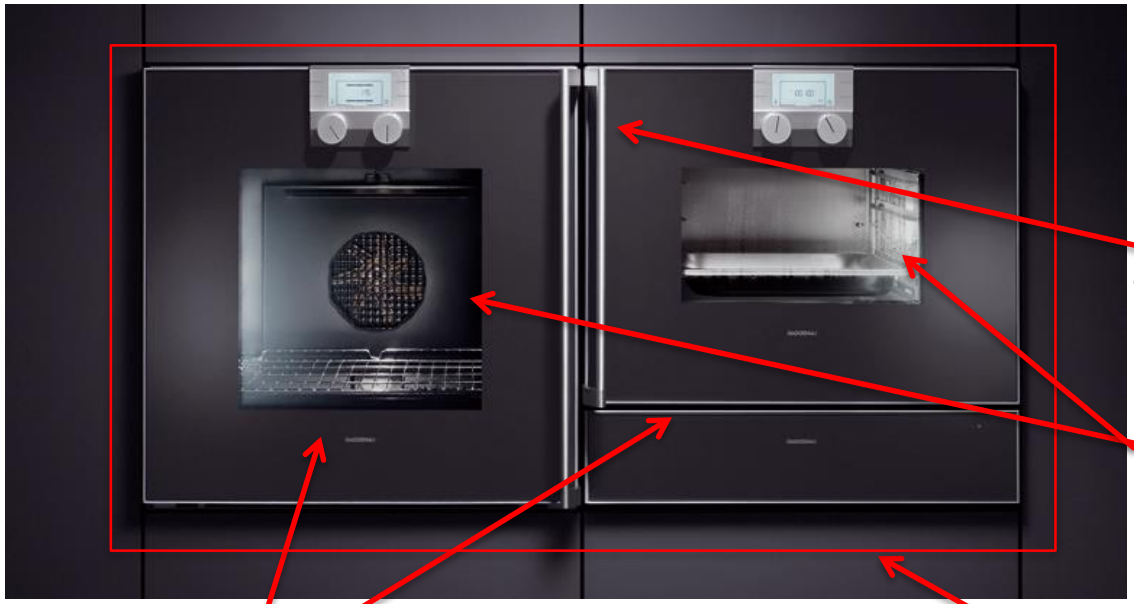
- (Calendar of meetings)
- (Web meeting tool)
- Sources:
  - **<u>Magazines</u>** & **<u>Web</u>**
    - Cose di casa
    - AE
    - Appliance
    - Ristorando
    - Master Chef
  - Customers and Suppliers
    - SMEG
    - Electrolux Professional
    - Whirlpool (Design)
    - Filippi (Design)
    - Suggestions ➔ new web sources
  - Associations & Organizations
    - ANIE
    - ENEA
    - Scuola Alberghiera Castelfranco V.
    - Gheggin
    - ISTAT (new)
  - Within the consortium
    - Catalogues, reports on technical visits etc.
    - Market data collection

Istat
Istituto Nazionale di Statistica

FOR M A T

1st - WHAT
The STF is for? (WHY we need the STF?)
- Model of STF at the functional level

PRIMARY FUNCTION: <transform> <food> <through heat>



STF = System to be Forecasted

AUXILIARY FUNZIONI:
<aid> <user> <handling>

<detach> <residual organic materials>

<transform> <food> <through heat> <controllable in temperature, humidity, exchange mechanism, duration, direction>

SECONDARY FUNCTION:
<transmit> <to people in the living room> <style, wealth, cooking competences of the owner>

FOR M A T

1st - WHAT
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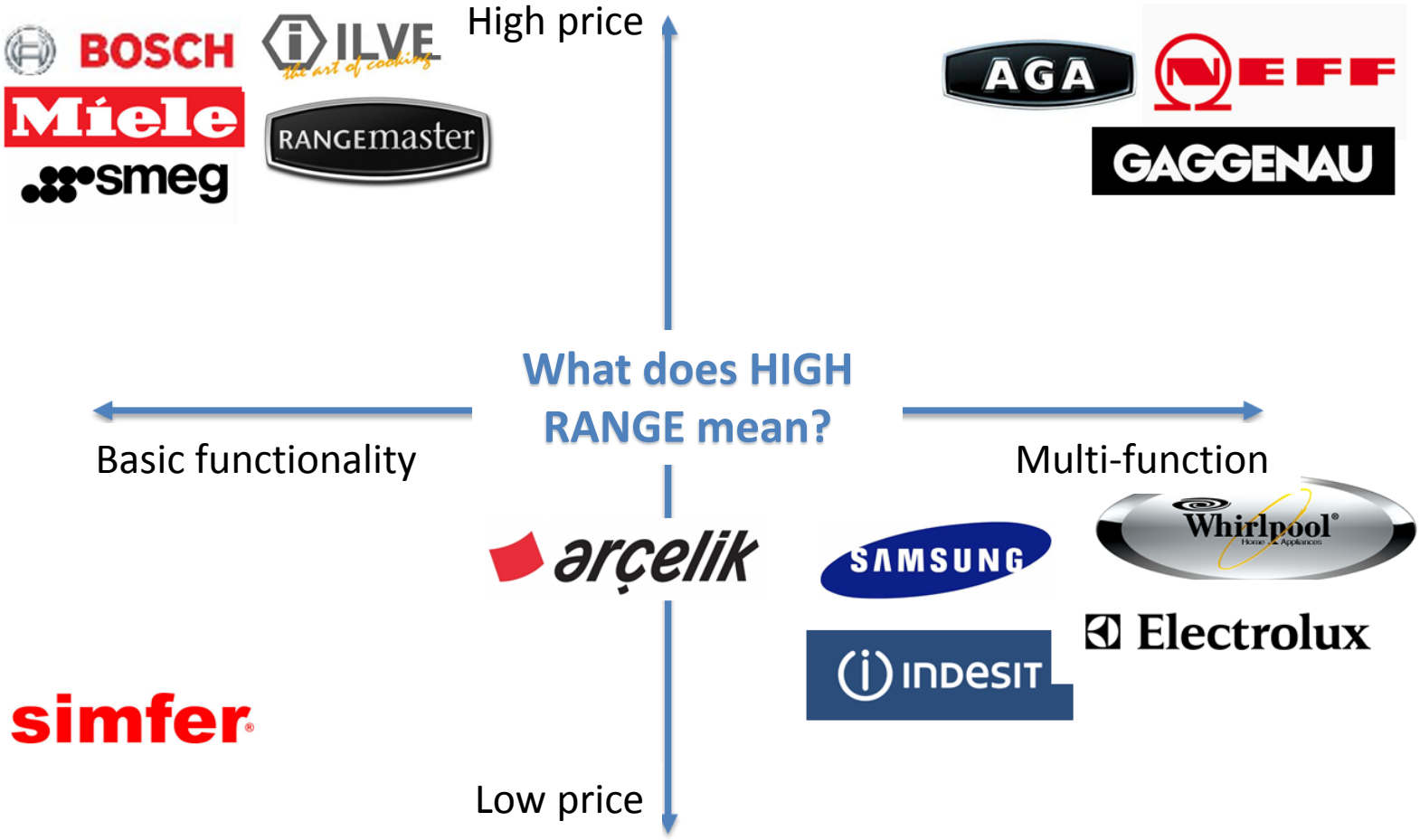


2nd - WHICH

Systems allow to get the same results?

- Description of Competitive (Alternative) technologies (solutions)

Alternative technologies that nowadays are used to deliver some functions of traditional domestic ovens…

2nd - WHICH

Systems allow to get the same results?

- Description of Competitive (Alternative) technologies (solutions)

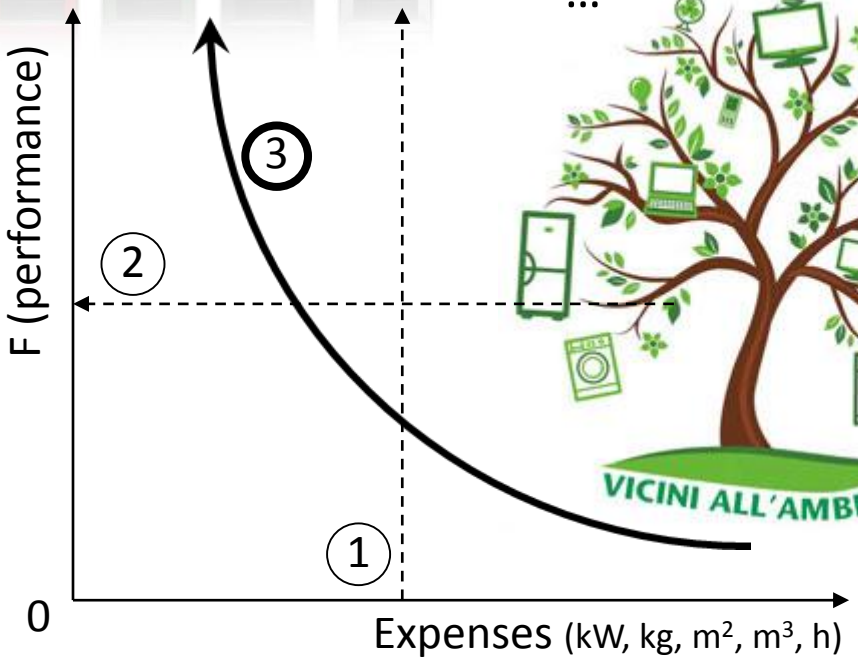
…don't seem to tend towards a complete substitution in the observed time interval (2014-2025):

ANALISI COTTURE A FORNO RICETTARIO CUCCHIAIO D'ARGENTO	1986	2009
ANTIPASTI/PIZZA	145	195
COTTURA A FORNO	37	93
% COTTURA A FORNO	**25,5**	**47,7**
PRIMI PIATTI	220	287
COTTURA A FORNO	17	29
% COTTURA A FORNO	**7,7**	**10,1**
SECONDI PIATTI PESCE	257	224
COTTURA A FORNO	49	58
% COTTURA A FORNO	**19,1**	**25,9**
SECONDI PIATTI CARNE	483	406
COTTURA A FORNO	50	90
% COTTURA A FORNO	**10,4**	**22,2**
SECONDI PIATTI	740	630
COTTURA A FORNO	99	148
% COTTURA A FORNO	**13,4**	**23,5**
% forno su TOTALE	**14%**	**24%**

3rd - HOW

To measure the Performances and the Expenses of the STF and its alternatives?

- Expenses are not money but limiting resources: TIMES (time, information, materials, energy, space, knowledge)



- Temperature and humidity control
- Variety of colours, texture, brilliance…
- Functional surfaces (self-cleaning, antimicrobial…)
- …

- Energy consumption
- Recyclability of materials
- Time and costs for cleaning
- …

FOR M A T

5th – WHAT

the STF and its main alternative(s) are, were and are expected to be?

Description for STF (and its main alternative?) with

- contexts=super-systems (TEES) and sub-systems
- past history & expected future
- present trends

SuperSystem Past	**SuperSystem Present** Living room, other cooking devices	**SuperSystem Future:**
System Past (1990-2010)	**System Present** System: Domestic oven	**System Future** (2015-2025)
SubSystem Past	**SubSystem Present** Aesthetic elements, handle, knobs, door-lock, automation devices	**SubSystem Future**

FOR M A T

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SubSystem Future (2015-2025)

System Future (2015-2025)

SubSystem Future

FOR M A T

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SuperSystem Future (2015-2025)

Home integration (open space, loft…)

Interiors flexibility

Multimedia interaction

Professional use

Extended automation

More attention to health & diet issues

FOR M A T

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- present trends

System Future (2015-2025)

Automation & control of the cooking process (also remotely)

Integration of the oven with other functionalities (freezer)

Higher environmental sustainability (lower consumption, energy recovery) + material recyclability

Lower involvement of human operation in tiring-annoying-dangerous operations

FOR M A T

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Description for STF (and its main alternative?) with

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- present trends

SubSystem Future (2015-2025)

Customization, variety of colours and finishing

Functional glasses (display, digital interface…)

Smart surfaces (self-cleaning, luminescent, anti-bacterial…)

Servo-mechanisms

Energy recovery

FORMAT

5th – WHAT

the STF and its main alternative(s) are, were and are expected to be?

Description for STF (and its main alternative?) with

- contexts=super-systems (TEES) and sub-systems
- past history & expected future
- present trends

Driver (1995-2015)

- Aesthetical and functional **customization**
- **Interaction** (with the user, with other appliances)
- **Energy efficiency**
- **Sustainability** of materials and manufacturing processes
- **Usefunlness** of novel features
- **Professional** use of the appliance and its functionalities
- **Enhancement of kitchen** with respect of other domestic spaces ✓
- Growing sensibility toward **hygiene health**, and **safety** ✓

tem

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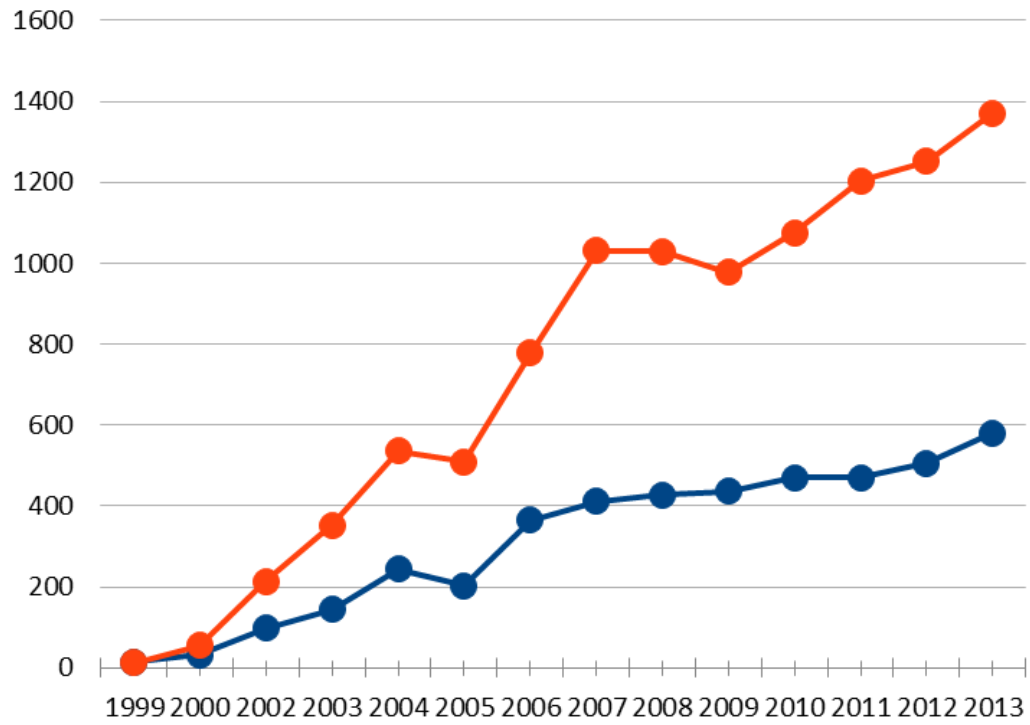
Barriers (1995-2015)

- Poor availability in industry of **ecomaterials** with adequate performance
- Poor availability in industry of **manufacturing technologies** requiring small investments and cheap
- Potential **safety** and **failure** problems
- **Lack of standards** concerning communication protocols and materials identification
- Lack of **supply chains** with adequate competences to ensure quality, reliability, innovation and sustainability

FOR M A T



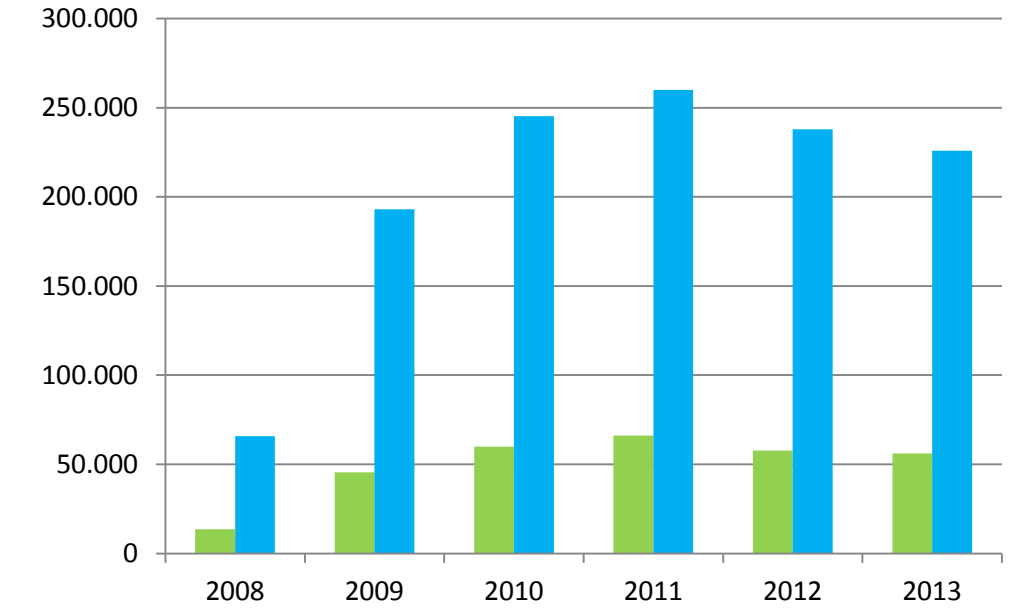
Lack of **supply chains** with adequate competences to ensure quality, reliability, innovation and sustainability

ISO 14001 certified manufacturing sites in ITALY

Tabella 5
RIPARTIZIONE DEI RAEE PER RAGGRUPPAMENTO 2013/2011 (KG)

RAGGRUPPAMENTO	TOTALE 2013	TOTALE 2012	TOTALE 2011	VARIAZIONE 2013/12	VARIAZIONE 2013/11
R2 Grandi bianchi					
lavatrici, lavastoviglie, cappe, forni, ecc.	56.156.357	57.709.717	66.132.447	- 2,69%	-15,09%

Lack of **supply chains** with adequate competences to ensure quality, reliability, innovation and sustainability



Poor availability in industry of **ecomaterials** with adequate performance

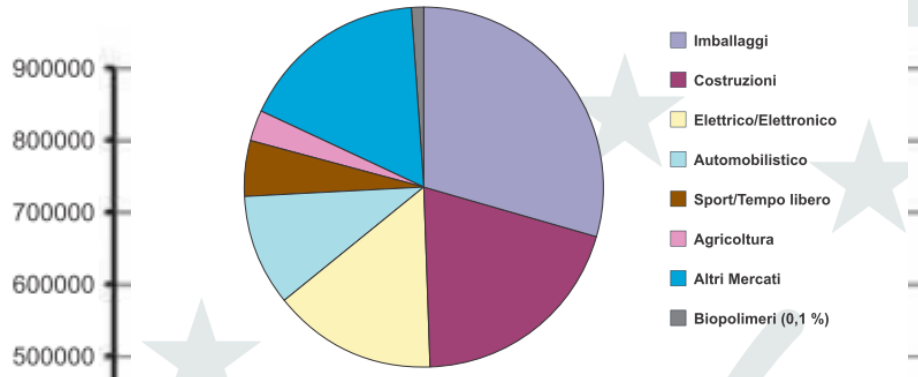


Figura 1. Suddivisione del consumo di plastiche in Europa a 15 paesi nel 2003. Fonte:IBAW

Figura 2. Evoluzione della capacità produttiva delle bioplastiche Fonte:IBAW

FOR M A T

Aesthetical and functional **customization**

Electrolux - Rex

Anno	2008	2010	2011	2012	2013
	5	5	2	5	5
	4	4	1	4	4
	4	4	1	4	3

SMEG

Anno	2008	2010	2011	2013	2014
	6	7	9	8	8
	3	6	5	6	6
	1	3	3	6	6
	1	2	3	4	3

Variety of colours in catalogues

Bosch

2009	2010	2011	2012	2013	2014
inox	inox	inox	inox	inox	inox

Siemens

2008	2010	2011	2012	2013	2014
inox	inox	inox	inox	inox	inox

FUNZIONI	2008	2009	2010	2011	2012	2013	2014
	10	13	18	18	19	21	23

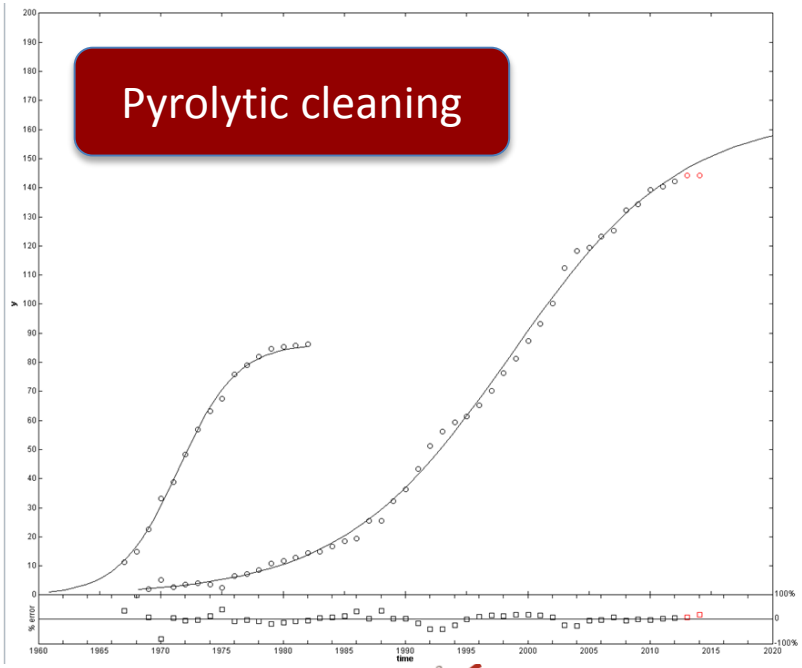
FORMAT

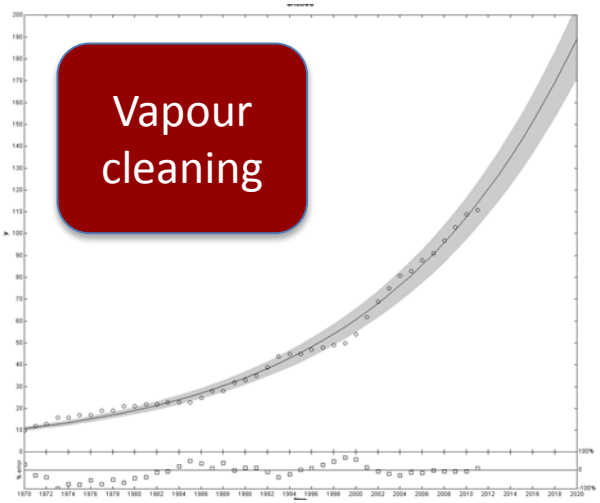
Define set of solutions addressing limiting resources

- Recognize relevant patterns
- Analogical reasoning for envisioning future with patterns of evolution
- Check coherence of the envisioned future with the available information about the context

FUNZIONI	2008	2009	2010	2011	2012	2013	2014
Parete posteriore con Ecolyse	x						
Pulizia Ecolyse per tutte le pareti		x	x				
Pulizia Ecoclean per tutte le pareti			x	xx	xx	xx	
Pulizia Ecoclean per tutte le pareti e fondo del forno							x
Autopulizia pirolitica	x	xx	xx	xx	xx	xx	xx
Vapour Clean						x	x
Estetica antimpronta						x	x

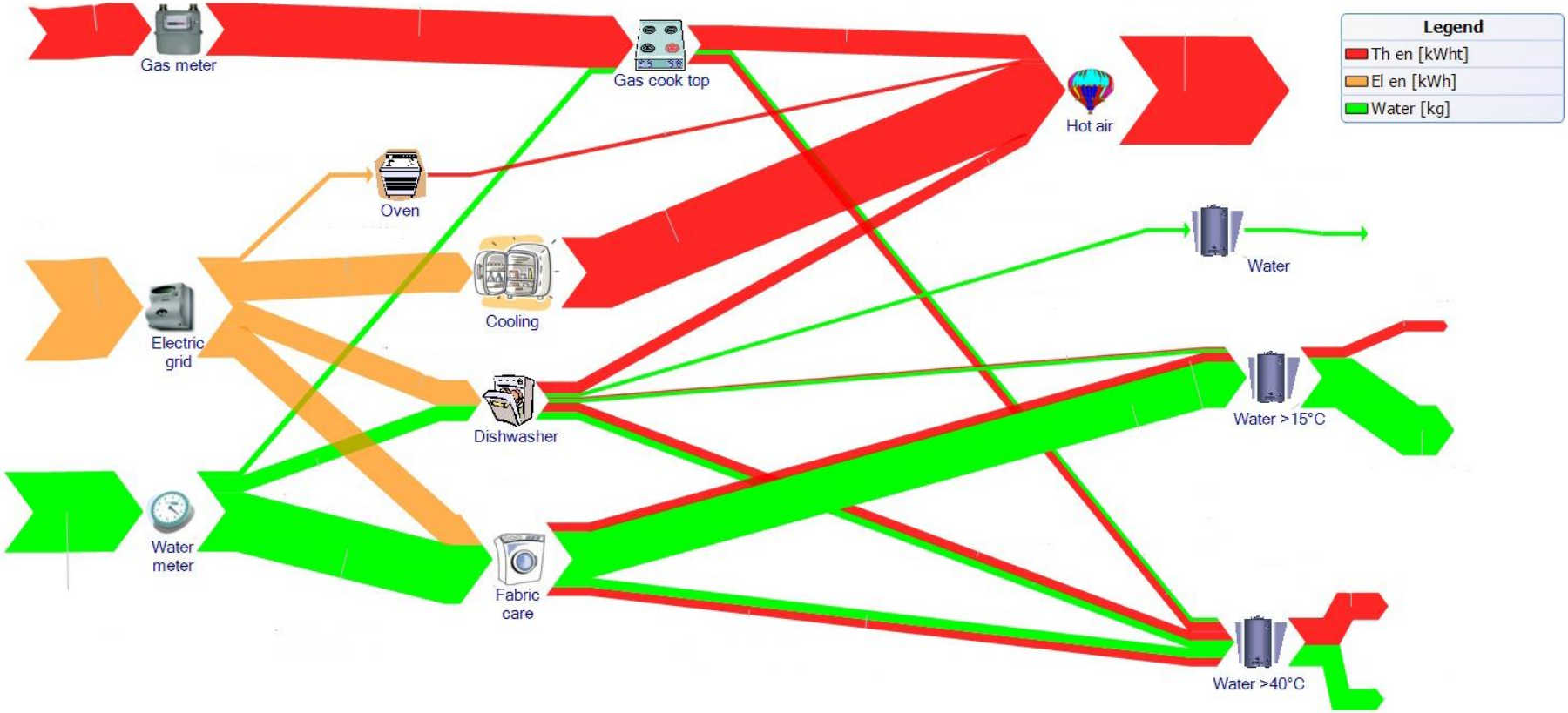
Legenda: Bosch Siemens Smeg





FOR M A T

Energy efficiency



Define set of solutions addressing limiting resources

- Recognize relevant patterns
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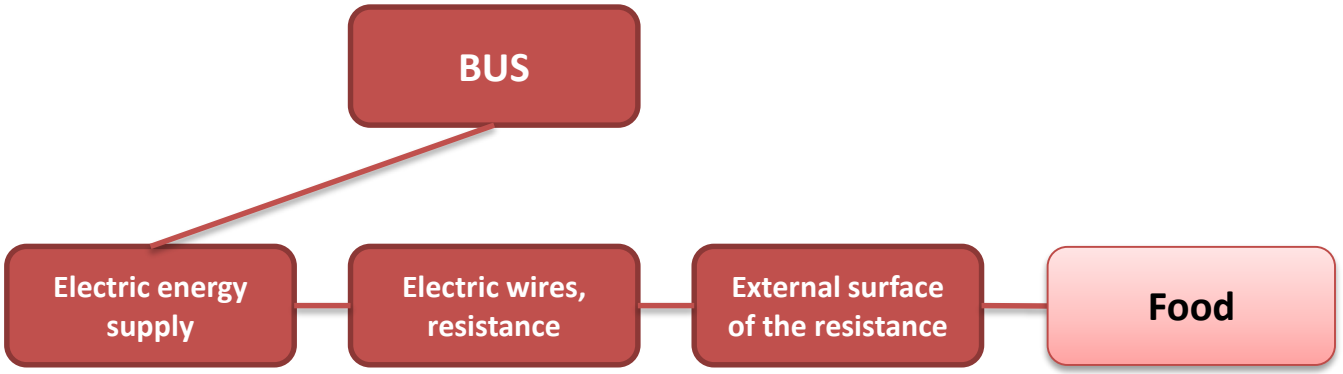
- <transform> <food> <through heat> <controllable in temperature, humidity, exchange mechanism, duration, direction>



➢ Check (in patent databases) trends on cooking control and monitoring

FOR M A T

Define set of solutions addressing limiting resources

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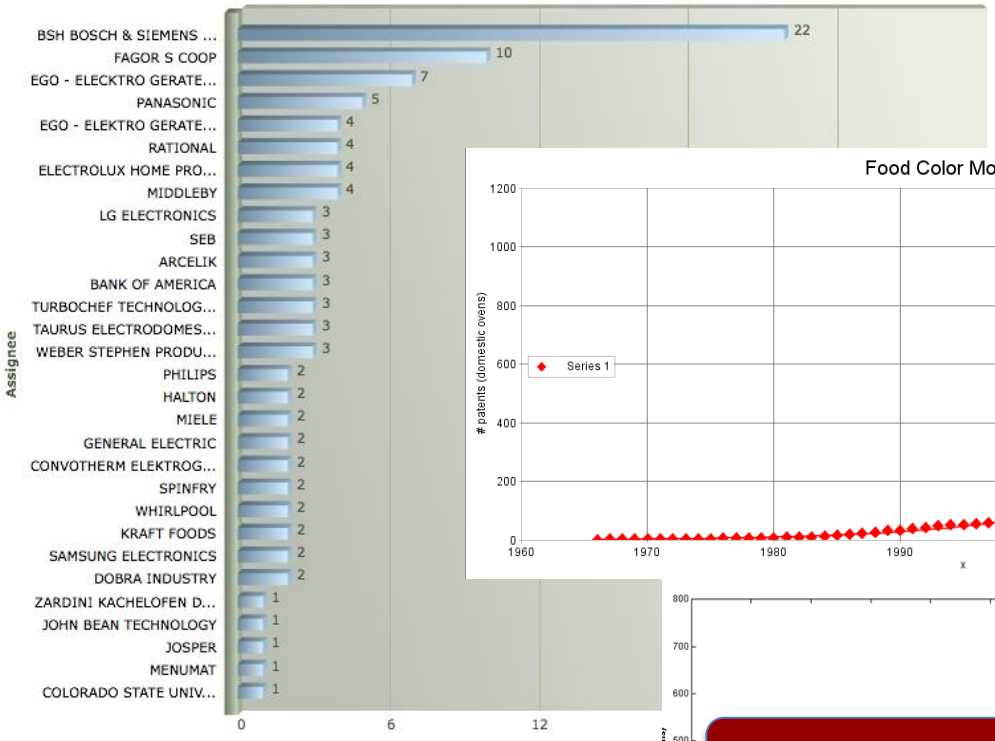
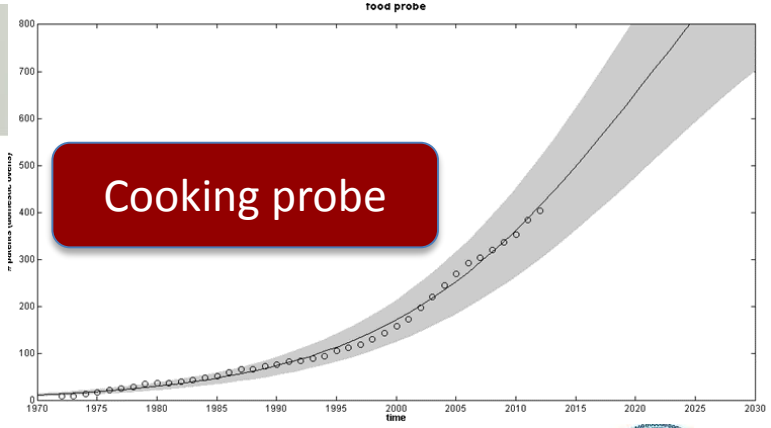


Food colour monitoring (while cooking)



Cooking probe

Build conclusions about future traits for STF

- To asses features of STF
- To group (chunk) features into main traits

Combined conclusions (2014-2025) - Topics:

1. Higher usage of domestic ovens
2. «Green» supply chains
3. Bio-plastics
4. Colours customization
5. Energy class
6. Servo mechanisms - costs
7. Auxiliary functions
8. Cleaning system
9. Professional cooking
10. Further aspects to be monitored

FOR M A T

Build conclusions about future traits for STF

- To asses features of STF
- To group (chunk) features into main traits

Combined conclusions (2014-2025) – Topic 2/10

- The growth of green supply chains is linear in Italy (higher with metals than with plastics), but still very limited ➔ the barrier for the development of truly eco-friendly domestic ovens is not about to disappear

Build conclusions about future traits for STF

- To asses features of STF
- To group (chunk) features into main traits

Combined conclusions (2014-2025) – Topic 3/10

- Bio-plastics are used more and more, but they are not expected to be used in household appliances in the analyzed time interval

FOR M A T

Build conclusions about future traits for STF

- To asses features of STF
- To group (chunk) features into main traits

Combined conclusions (2014-2025) – Topic 8/10

- Pyrolytic ovens have reached a technological stability, no significant innovations are expected to appear in the next ten years;
- Vapour cleaning is rapidly evolving, a larger diffusion is expected

FOR M A T

Build conclusions about future traits for STF

- To asses features of STF
- To group (chunk) features into main traits

Combined conclusions (2014-2025) – Topic 9/10

- Competence and skill of users (of domestic ovens) are growing: more professional features are about to appear (probes, sensors); different cooking modes (vapour, “sous-vide”…) will be proposed.

Reflections at the end of the project experience:

- The project allowed to combine and integrate the complementary competences of the partner companies
- It required a certain investment of time
- It seems necessary to have a facilitator to run a project (at least first time)
- A project like this should be repeated every 1-2 years
- The focus of the project should be kept narrow enough ➔ companies with diversified stock should join more specific projects rather than a comprehensive one