

*Innovative fully biodegradable mulching films & fruit protection bags for
sustainable agricultural practices LIFE14 ENV/ES/00048*

LIFE MULTIBIOSOL



**Life BiocopaPlus: sustainable bio-lacquer for food cans
from tomato peels**

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SSICA, Experimental Station for the Food Preserving Industry, is a **Research Institute**, established in Parma in 1922.

SSICA activities focus on applied research regarding the production chain in the agro-food sector and food processing industry.

SSICA has about 80 employees in 2 locations, Parma and Angri (SA).



The **Packaging department** focuses its activity on the hygienic-sanitary properties as well as on the correct functioning of the containers and of the materials involved in relation with their construction characteristics and operating conditions for use: **metal, glass, plastic, bioplastic and rubber**

Metal packaging is made of tinplate, TFS and Aluminum.

The metal substrate is protected with a thin organic coating both on the **internal and external surface**, which is essential to prevent corrosion



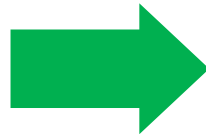
The coating: most of the coatings for internals are made starting from epoxy resins, because of their exceptional mechanical and chemical resistance. (**BPA** migration limit: 0.6 mg/kg)

THE KEY-IDEA

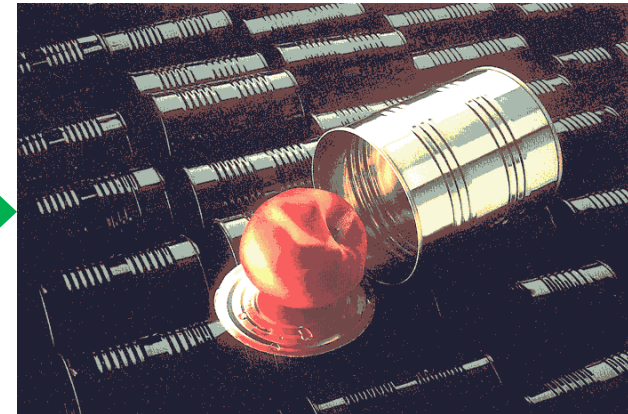
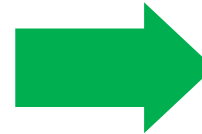
starting from tomato industrial residues to formulate a **bio-based lacquer** to protect metal cans and closures.



from renewable resources



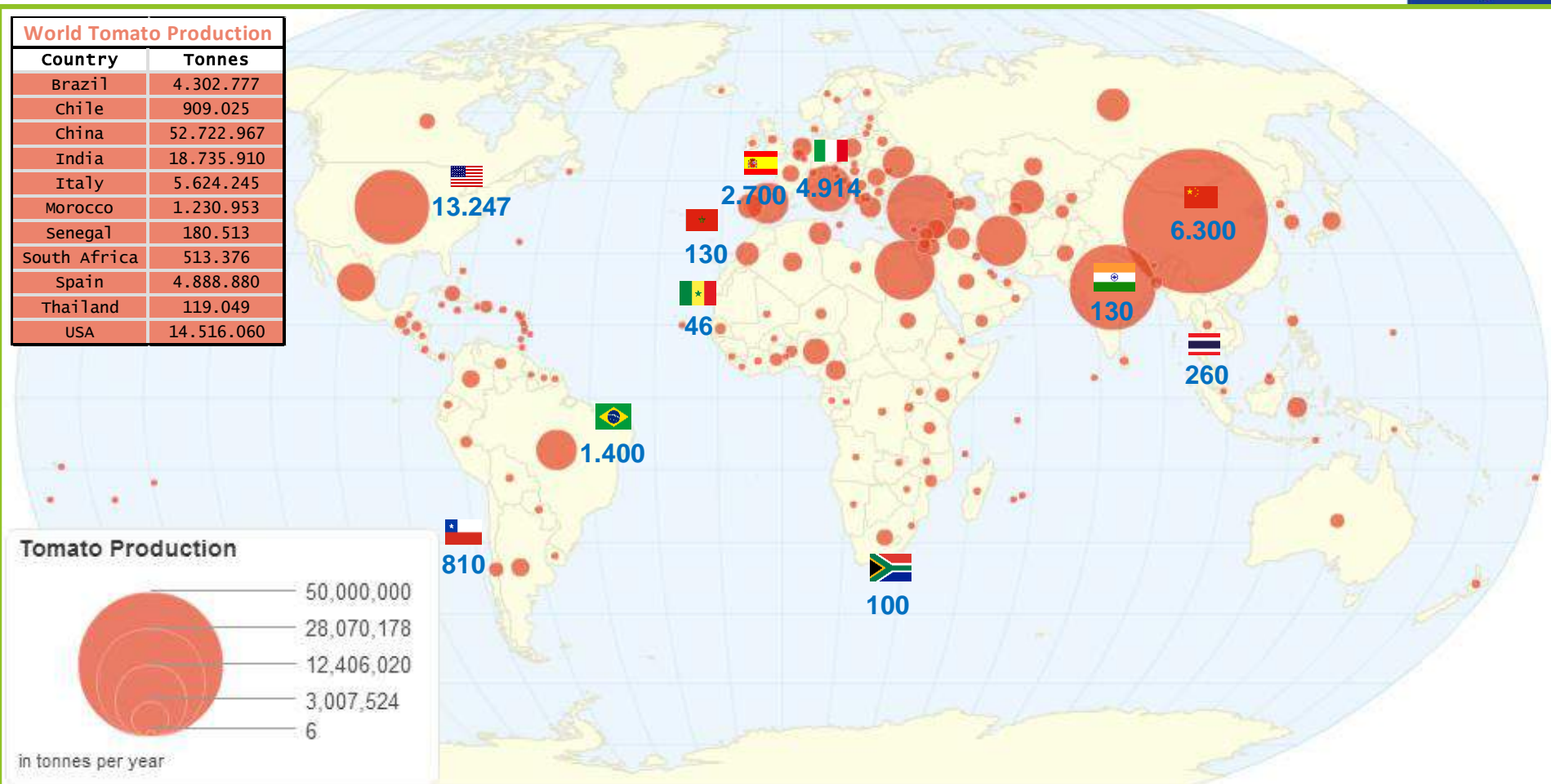
bio-lacquer



to metal packaging

The global metal packaging market is expected to grow by **4.5%** annually to a total value of **\$132.1 billion** in 2021. Strong growth of end-use industries in emerging countries, India, China and Brazil.

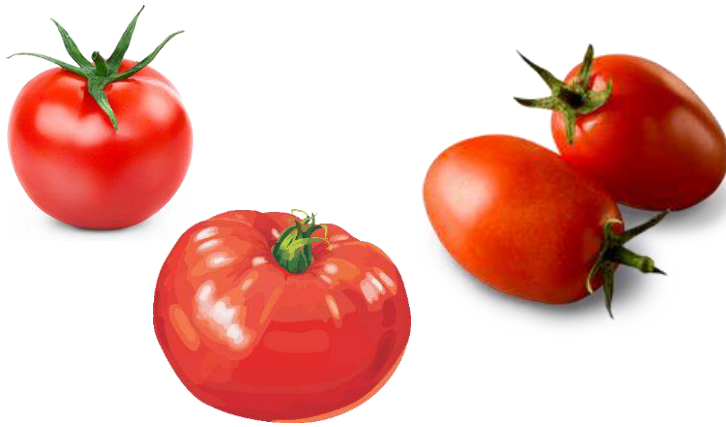
World Tomato Production: 170 mln tonnes



World Tomato Processed: 38 mln tonnes

WPTC World production estimate of tomatoes for processing (in 1000 metric tonnes)

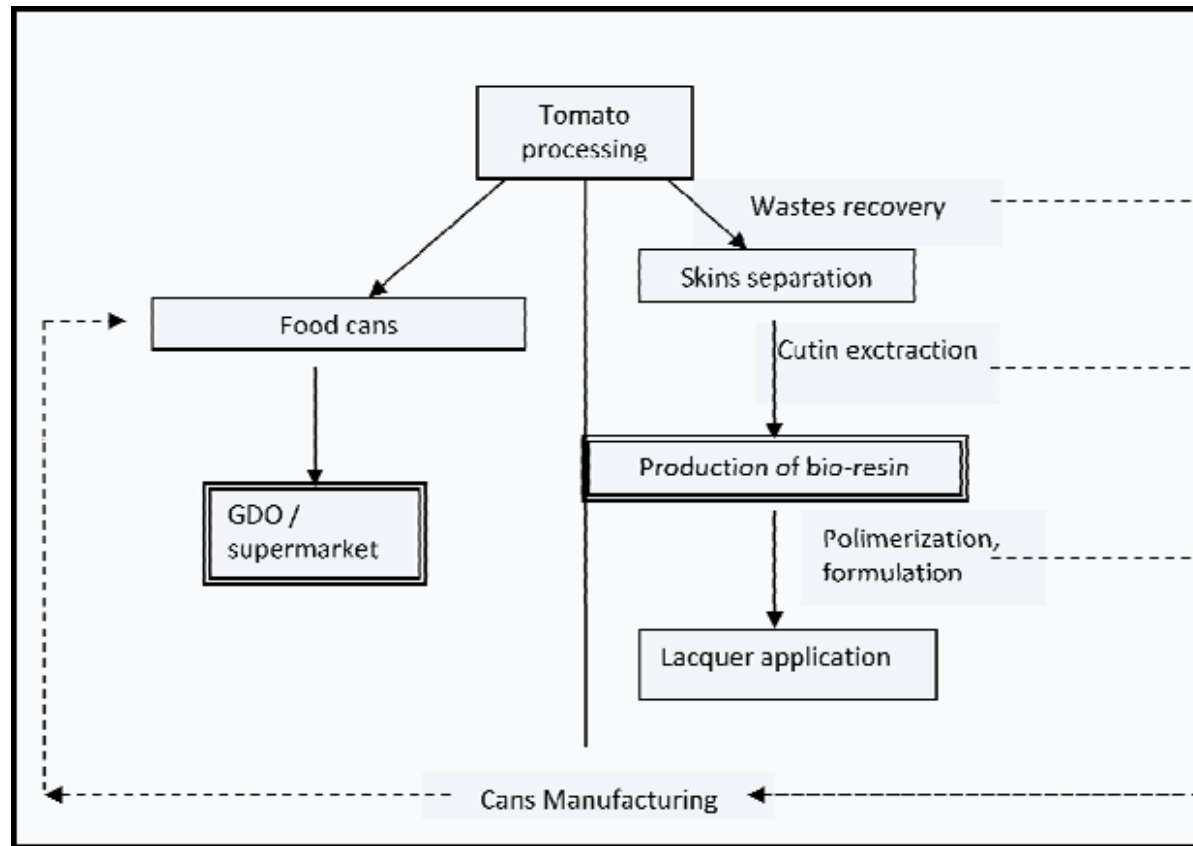
The initial substance is **cutin**, a component of the cuticle of the tomato peels.



Each year in the world more than
1 mln ton
of solid tomato
residues (peels and
seeds) are produced.

- The tomato cutin is a **natural polymer of polyester type**
- The main component of tomato cutin is the **10,16 dihydroxyhexadecanoic acid (70-80%)**, starting substance for the polymerization

BiocopacPlus Life project is based on the positive results obtained in any step of the experimental work developed at laboratory level in the **FP7 Biocopac** project.



BiocopacPlus (June 2014- December 2017)

Objectives

- To prove on semi-industrial scale the technical feasibility of the production process of the bio-lacquer
- To realize a pilot plant
- To evaluate yields and costs



STAZIONE SPERIMENTALE PER L'INDUSTRIA DELLE CONSERVE ALIMENTARI



LEADERS
INNOVATE.

azienda agricola
VIRGINIO CHIESA



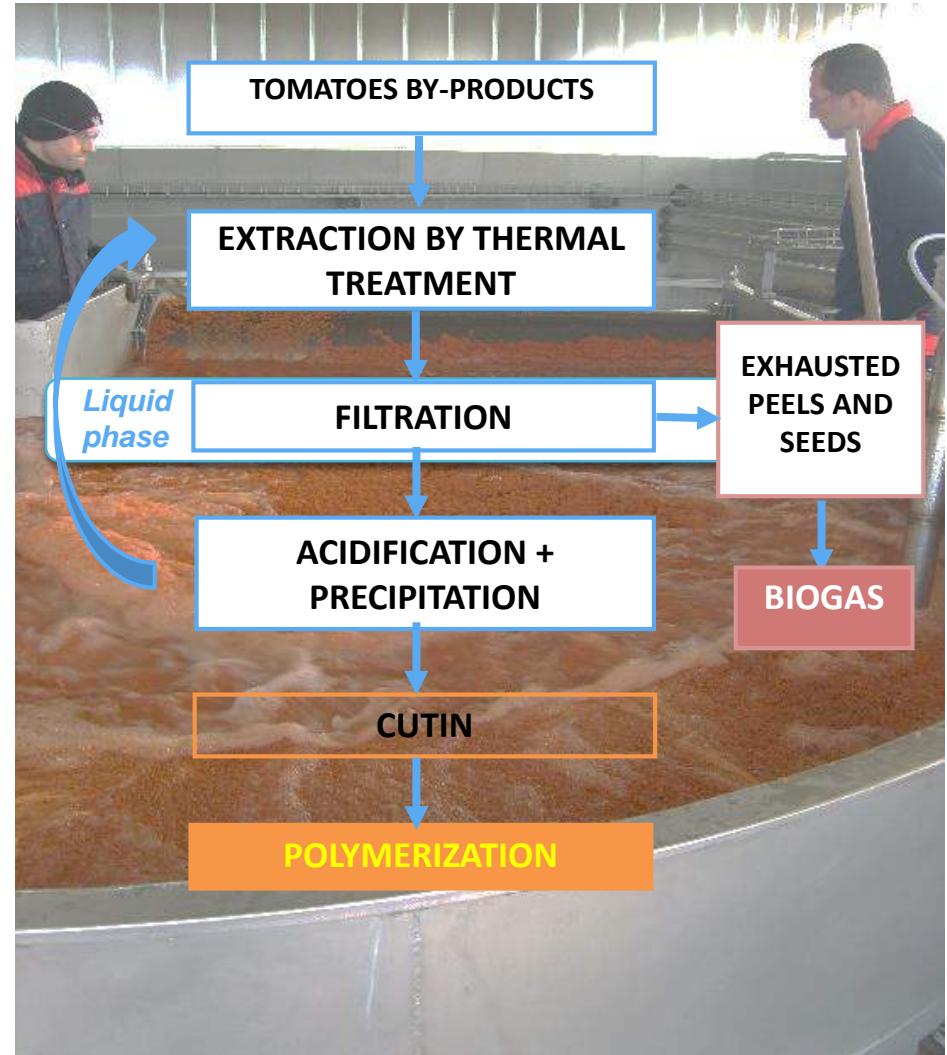
Total cost: € 2.056.045
(LIFE+ contribution: 50%)

Methodology of cutin extraction developed at pilot scale

(Italian Patent n. 0001419412)



Production site: Azienda
Agricola Virginio Chiesa,
Canneto sull'Oglio (MN)



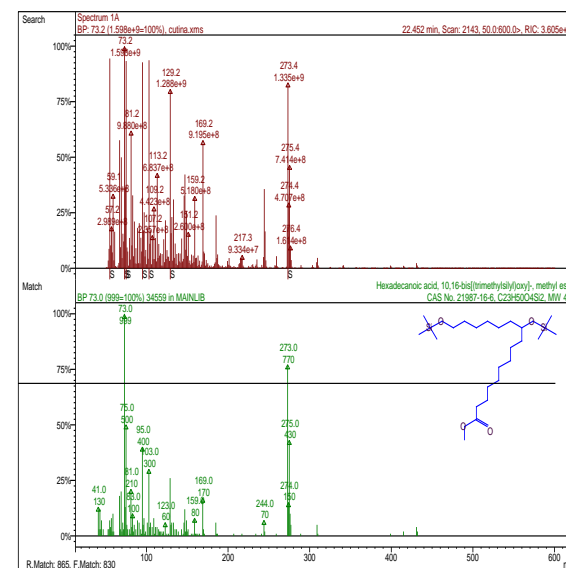
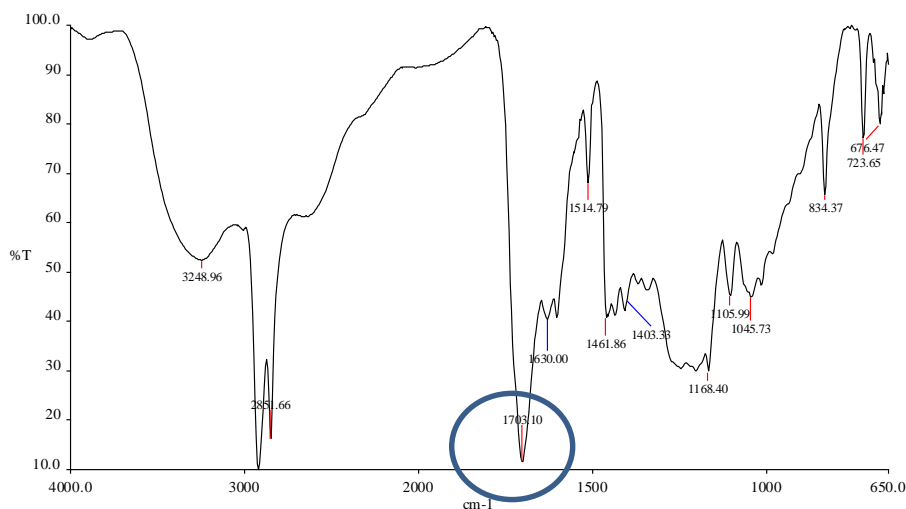
- Pilot plant capacity: **100kg/h**, equal to 10-20% of a future industrial line
- Yield of extraction: **10-15%**



Test performed	Skins processed	Cutin extracted
35	5050 Kg	245-250 Kg

Cutin characterization

- **FTIR spectrum** All cutin samples presented the characteristic peaks of an aliphatic fatty acid at **1702 cm⁻¹**
- **GC-MS analysis** Principal **unit of tomato cutin** was identified as the **10,16 – bishydroxyhexadecanoic acid (70-80%)**
- **GPC spectra** Relative molecular weight **650 g/mol** (GPC based on calibration with polystyrene standard)



Cutin contamination

- Heavy metal <10ppb
- Sugars and fibers <0,5%
- No pesticides residues
- No microbiological charge

The extraction method is **reproducible** independently from

- the geographical origin of the peels
- the kind of peels: any type, also homogenized
- the peels from which lycopene has been previously extracted

Better performances of the exhausted peels for the biogas production



Sample	Yield of biogas (dm ³ / Kg of v.s.)	Volatile substances (%)
Tomato peels as they are	43 dm ³ / Kg of v.s.	70%
Exhausted tomato peels	100 dm ³ / Kg of v.s.	65 %



- ✓ Formulation and production of the **new bio-lacquer (50kg)**
- ✓ **Industrial application** on aluminium, tin free steel and tinplate
- ✓ **Industrial production** of 2 and 3 pieces cans and open top ends
- ✓ **Compliance** with the Italian and European legislations. The lacquer does **not modify** the products' organoleptic characteristics.

Filling of the cans; LCA



The cans (4000) were filled with **tomato, legumes and fish products** and stored at 20, 37 and 50°C



The results of the pack-test (in progress) are very interesting and promising. LCA results are really impressive



In comparison with a standard lacquer of fossil origin lower emissions of CO₂, equal to **130.7 mg** in the CO₂ produced (or avoided) for each can.

Optimization plant components

Reduction environmental impact of the process

Evaluation pack test

Evaluation cost



implementation of
BiocopacPlus pilot plant

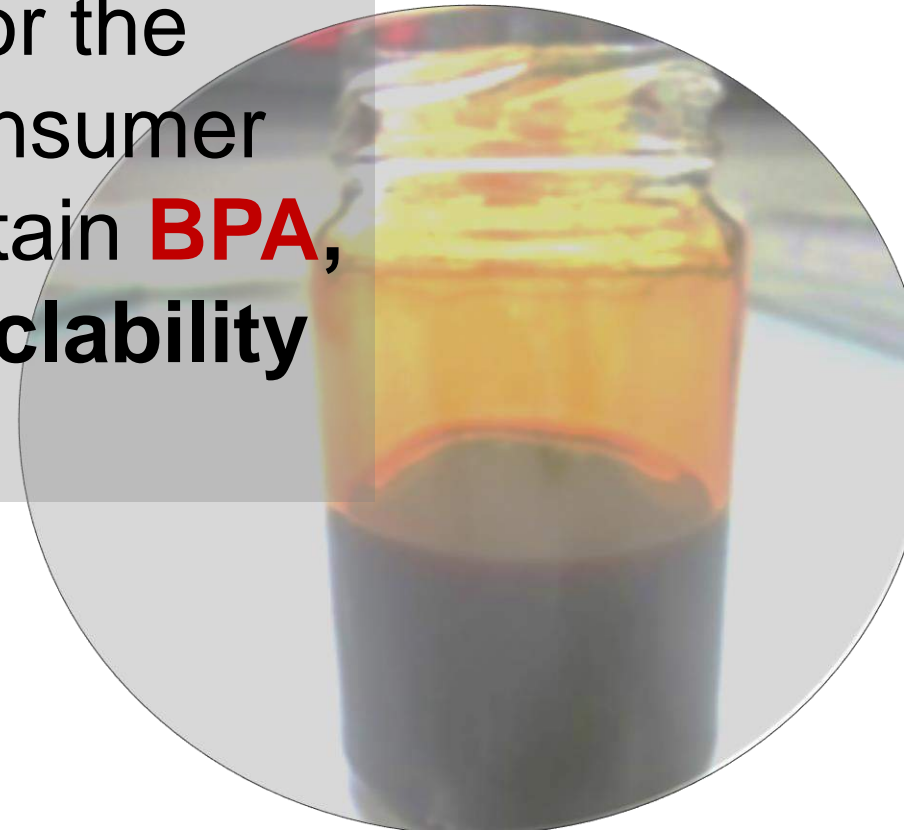


to treat several vegetable by-products,
tomato cull, wheat. olive, potato



Conclusion

The **bio-based lacquer we are developing** meets the demand for sustainable production and for the safeguarding of consumer health, it doesn't contain **BPA**, it improves the **recyclability** of the can



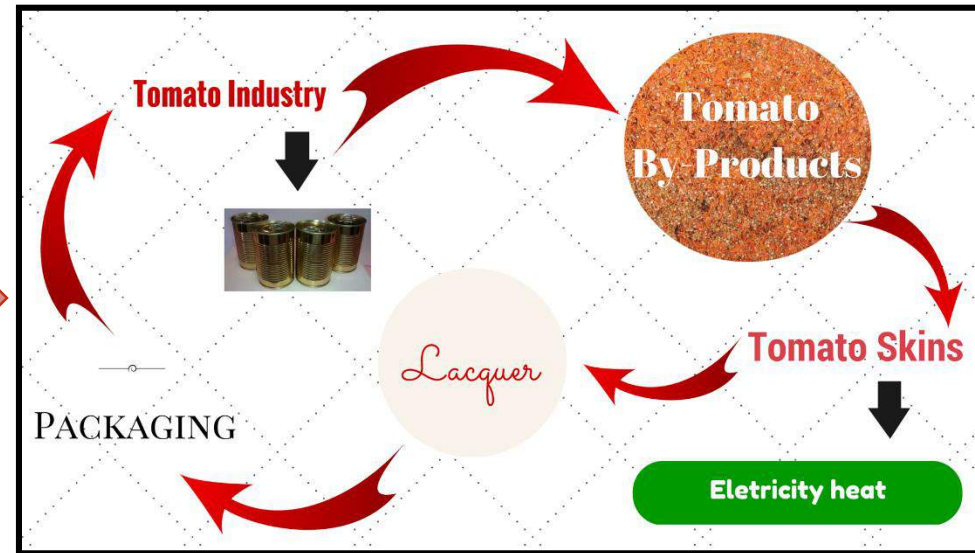
Conclusion

Simple and well-known technologies
No organic solvent in the process
No environmental permission required
High performance and yield
At a relatively low costs

Total cost of the prototype € 800.000,00

easy to
replicate even
in a tomato
industry

Locally sourced
lacquer





Thanks for your attention

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Tomatoes with a can do attitude
29/09/2014