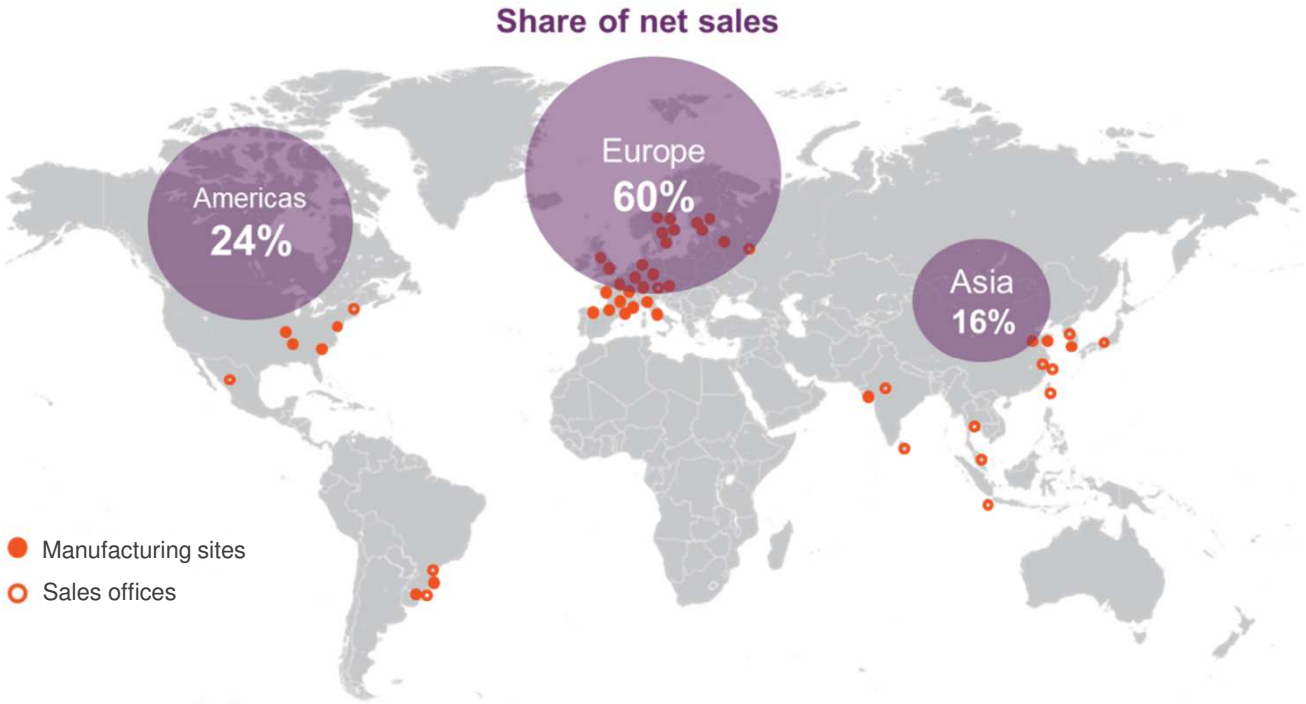
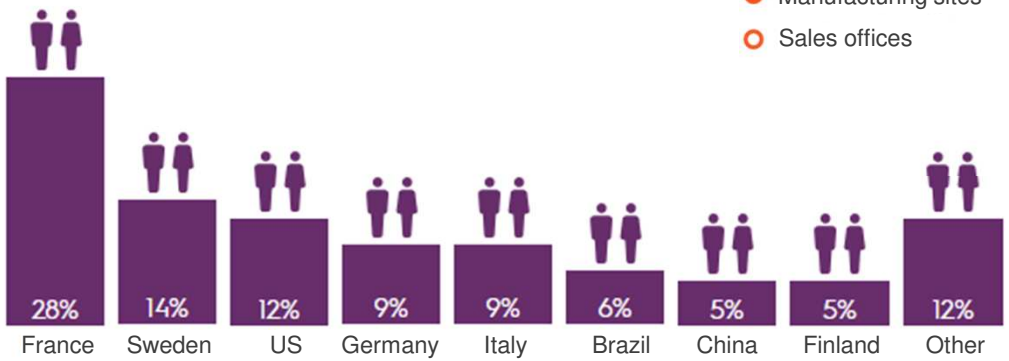

We have only seen the beginning of what
fiber-based materials and solutions
can be used for
Imagine fiber
AHLSTROM
MUNKSJÖ


AHLSTROM
MUNKSJÖ

A global leader in fiber-based materials

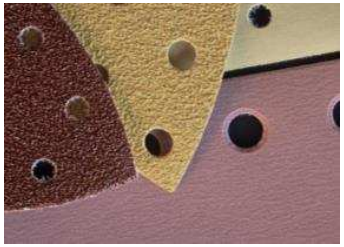
- 6,000 employees
- Global network of sales offices and 40 plants in 14 countries
- More than 7,000 customers in over 100 countries
- Pro forma sales EUR 2.2 bn
- Market capitalization EUR 1.6 bn





Our materials are part of products in your everyday life

Some examples



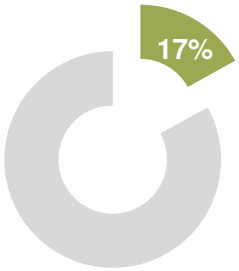
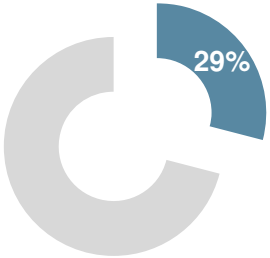
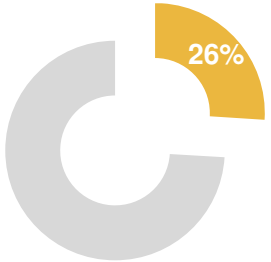






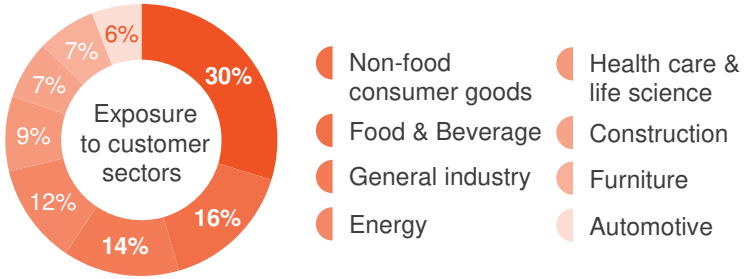


Our business areas

BUSINESS AREA	DECOR	FILTRATION AND PERFORMANCE	INDUSTRIAL SOLUTIONS	SPECIALTIES
				
SHARE OF NET SALES, %				
PRODUCTS	• Decor paper • Thin print papers	• Oil filters • Fuel filters • Air intake filters • Gas turbine filters • Industrial filters • Glass fiber tissue for flooring and reinforcement for wind mill blades • Wallcovers • Specialty nonwovens • Flushable wipes	• Abrasive backings • Electrotechnical insulation • Release liners • Thin papers • Specialty pulp • Balancing foils • Fine art and printing papers	• Food and beverage packaging • Packaging papers • Graphical papers • Medical fabrics • Metallized labels • Tape • Laboratory filters and life science diagnostics • Water purification • Printed and coated products

Business area

Industrial solutions



Products in Business area Industrial Solutions

	PRODUCT AREA	APPLICATIONS	CUSTOMERS
	**Fine art and printing papers**	• Watercolor paper • Drawing and art publishing paper	• Artists • Printmakers and art publishers
	**Release liners**	• Self-adhesive labelling and graphics • Double sided adhesive tapes • Industrial applications	• Self-adhesive laminate manufacturers • Industrial siliconisers
	**Abrasive backings**	• Backings to sandpaper to grind and sharpen metal, furniture, construction material, flooring	• Manufacturers of abrasive materials
	**Electrotechnical insulation**	• Insulation of high-voltage cables • Insulation of transformers • Bushing	• Power transmission and distribution industry
	**Thin paper**	• Interleaving paper for steel, aluminum etc. • Masking paper	• Manufacturers of steel, glass, aluminum
	**Balance foils (Spantex™)**	• Balanced foils for veneered furniture and flooring • Balanced foils for laminate • Edge-banding foils	• Manufacturers of furniture, floors and worktops
	**Specialty pulp**	• Transparent paper • Hygiene products • Filter paper • Electrotechnical paper	• Manufacturers of construction materials, sanitary products, paper, cardboard, filters, packaging • Global players in power supply

Products in Business unit Release Liners

Different types of paper substrates are used today as release liners:

- Clay Coated Kraft (CCK) : coated papers with one or two layers of coatings (mainly latex and pigments)
- Glassine papers : highly refined papers, treated with water-soluble agents (PVA and CMC or starch) and supercalandered offline
- Soft Calendered Kraft (SCK) : highly refined papers, treated with water-soluble agents (PVA and CMC or starch) and calandered online
- Machine Glazed Kraft (MG Kraft)

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Innovation and product development is key to success

Some examples

Dress made of paper from our Billingsfors plant in Sweden

TEX-STYLE – abrasive backings of paper substituting cloth backings

Coffee pods made with our compostable filter material

Innovation and product development is key to success

Some examples

Trinitex Advance – filter media for air filtration

PureArmor – nonwoven fabric protecting from viruses, bacteria and particles

BioWeb – biodegradable teabag made of PLA (biopolymer)

ActiV – release liner for more effective siliconising

The way to ActiV

The silicones

Silicones are mainly existing in the paper industry in 3 categories:

- Water based silicones : mainly used for food applications (ex of baking paper)

- UV silicones, based on radical mechanism : applications for small volumes

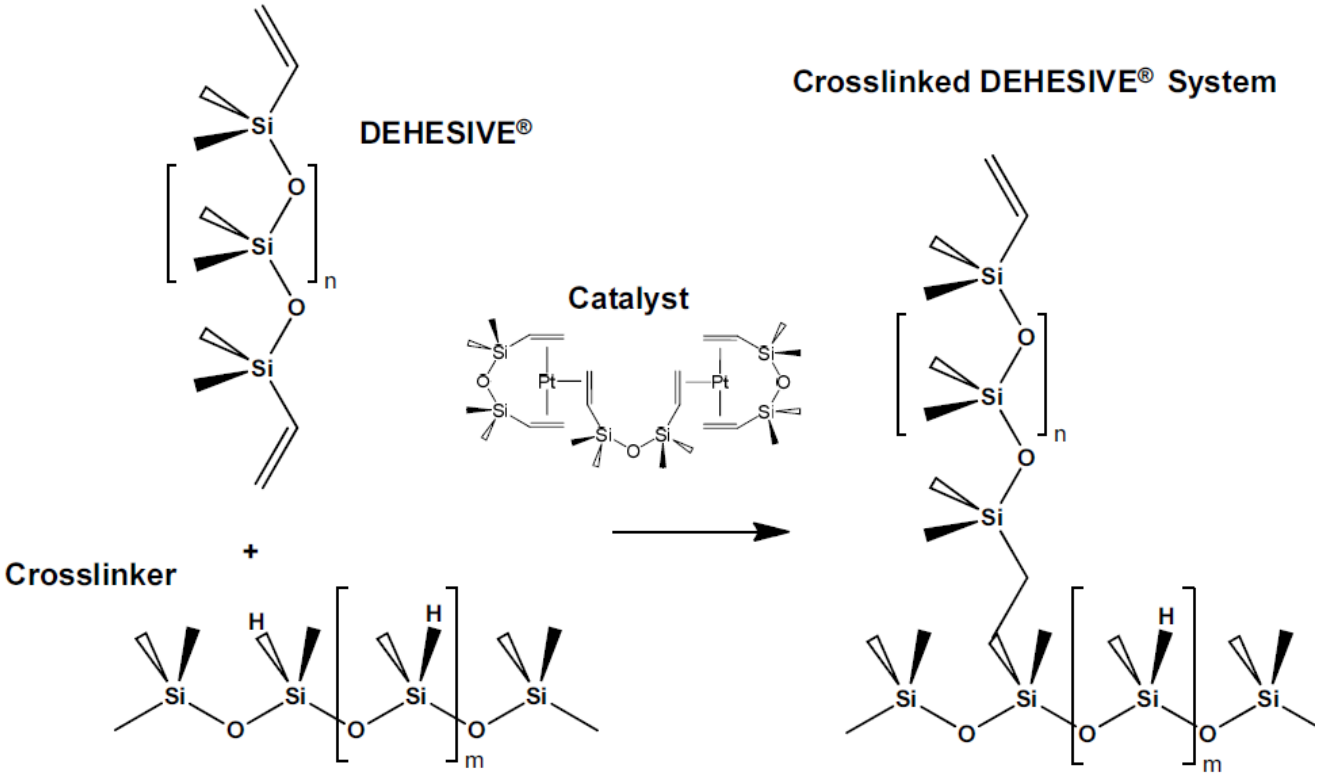
- Thermal silicones, based on cationic mechanism : widely used in the off-line coating of release agent.

Nb: today, a great majority of thermal silicones are solvent free. Solvent based silicones still exist in Asia.

The way to ActiV

The silicones

The chemistry of thermal silicones.



Source : Wacker company

The way to ActiV

What happened?

In the late 90's, new silicones came on the market: LTC silicones for Low Curing Temperature silicones.

These silicones could react at temperatures below 100°C versus 120-130°C for standard silicones.

Advantages:

- Energetic gains for converters: the oven temperature could be decreased
- Less thermal stress for the paper
- Less remoisturizing constraint of the paper after siliconizing
- And possible increase of the coating process

BUT no rubb off: the adhesion between the substrate and the new silicones was weak. The silicone layer could be easily removed by scratch or abrasion leading to quality issues.

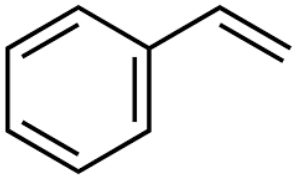
Due to the high reactivity of the silicones, there was no condensation between OH of the paper surface and the new silicones

The way to ActiV

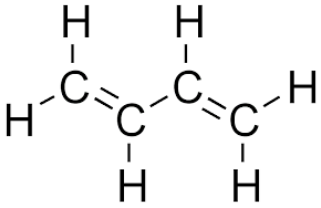
Genesis

In Ahlstrom's Research Center of Pont-Evêque, a team worked on the topic to improve the adhesion of LTC silicones on paper substrates.

They discovered that cellulosic substrates coated with styrene butadiene latex strongly improved the adhesion of LTC silicones on the substrates.



Styrene



Butadiene

This lead to a first patent filed the 17th of July 2002

Ref.	Fournisseurs	Nature	Rub-Test
XZ 96489	Dow Chemical Company	SBR	96,8
DL 920	Dow Chemical Company	SBR+ ACRYLONITRILE	96,5
DL 955	Dow Chemical Company	SBR+ ACRYLONITRILE	95,6
DL 930	Dow Chemical Company	SBR	95,3
DL 980	Dow Chemical Company	SBR+ ACRYLONITRILE	94,5
DL 940	Dow Chemical Company	SBR+ ACRYLONITRILE	93,8
DL 935	Dow Chemical Company	SBR+ ACRYLONITRILE	93,8
DL 950	Dow Chemical Company	SBR	93,7
XZ 96452	Dow Chemical Company	SBR+ ACRYLONITRILE	93,9
DL 945	Dow Chemical Company	SBR	92,9
DL 966	Dow Chemical Company	SBR+ ACRYLONITRILE	95,2
DL 951	Dow Chemical Company	SBR	94,3
A 360D	B.A.S.F	STYRENE-ACRYLATE+ ACRYLONITRILE	70,5
A S866	B.A.S.F	STYRENE-ACRYLATE+ ACRYLONITRILE	47,1
XZ 94329	Dow Chemical Company	STYRENE-ACRYLATE	40
A S320D	B.A.S.F	STYRENE-ACRYLATE	37,3
A S305D	B.A.S.F	STYRENE-ACRYLATE	34,7
A 500D	B.A.S.F	ACRYLATE/VINYLE-ACETATE	34,4
A 208	Latexia	POLYVINYLE-ACETATE	33,6
A S278	B.A.S.F	STYRENE-ACRYLATE	33
SD 215	Latexia	STYRENE-ACRYLATE	28,4
HPN20	Dow Chemical Company	STYRENE-ACRYLATE	25
V 8330	Vinamul	POLYVINYLE-ACETATE	20,2

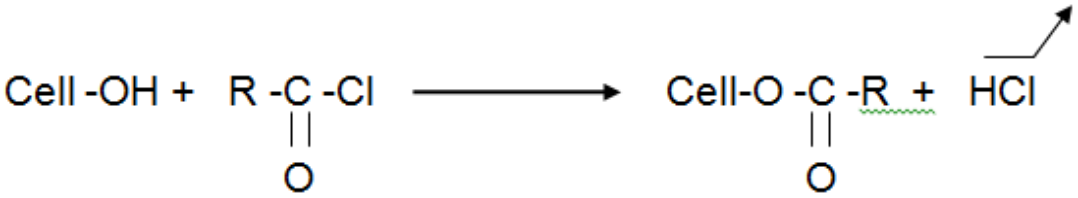
The way to ActiV

Second step

In 2001 a European Project lead by CTP and CNRS opened. It was called PHYCELLO and proposed to develop within the paper industry a new concept of chemistry (named Chromatogenic chemistry), in order to develop an innovative production process for cellulose-based materials with hydrophobic properties.

Main idea of this technology was to graft long fatty acid chlorides on the surface of the cellulose.

Chemical reaction between fatty acid chloride and cellulose :



The way to ActiV

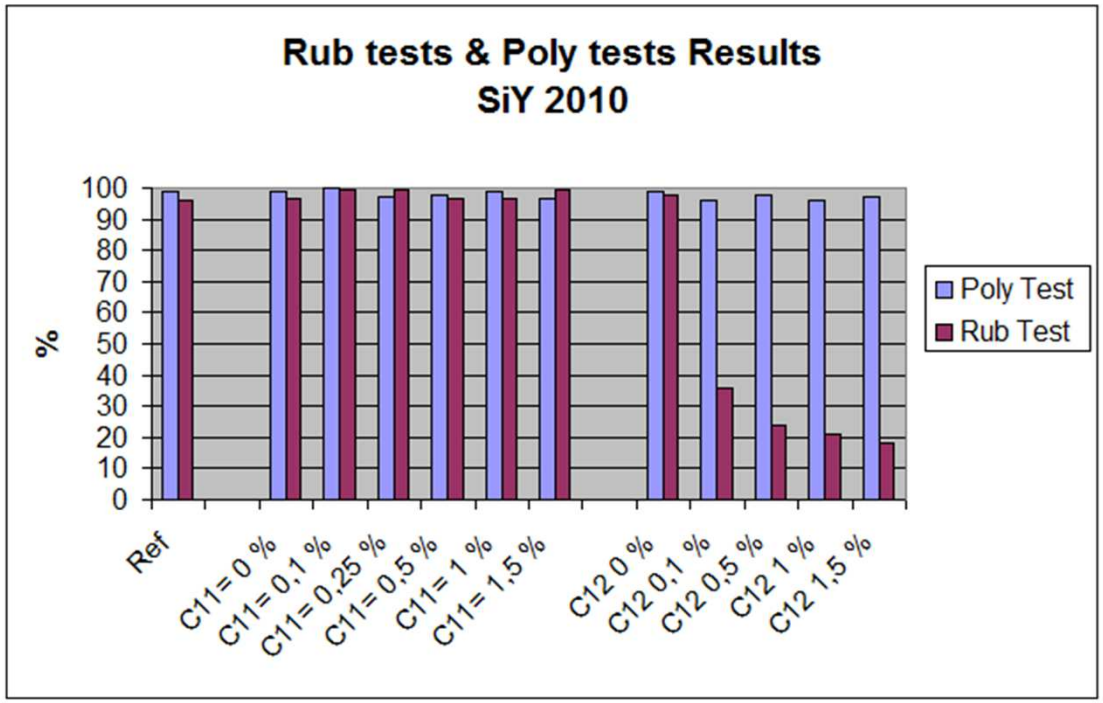
Second step

In Pont-Evêque, at Ahlstrom Research Center, they had the idea to include in the project a fatty acid chloride with a vinyl function at one end to validate one idea: the addition of vinyl function at the surface of the substrate improve the silicone adhesion.

This explains why SBR latex exhibit such good rubb off values.

So 10-undecenoic acid chloride (unsaturated C_{11}) : CH_2=CH-$(CH_2)_8$ –CO-Cl : *(=C_{11})* was introduced in the list of molecules to be tested.

Due to the relative short aliphatic chain, 10-undecenoic acid chloride did not improve hydrophobic properties of the paper. But it clearly improved rubb off after siliconization.



Cross linking yields (poly tests) and degrees of adhesion (rub tests) of glassine (SiY 2010) treated by chromatogenic chemistry with undecenoic acid chloride (=C_{11}) and lauric acid chloride (C_{12})

The way to ActiV

Second step

This lead to a first patent filed the 23rd of January 2003

This technology has never been developed by Ahlstrom because chromatogenic technology was only off-line at that time and investment was too important.

The way to ActiV

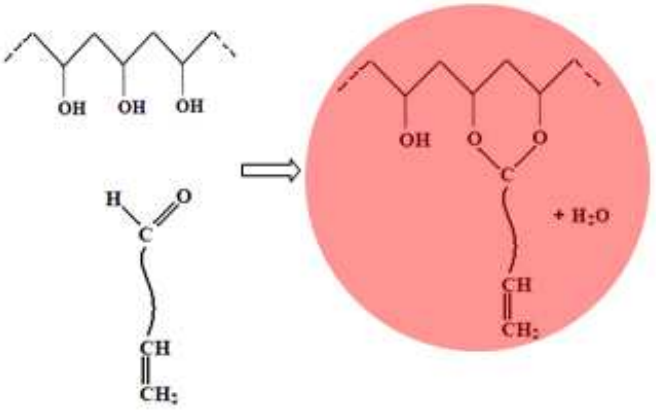
Final step

New solution was needed.

In 2006, a publication about solvent based modification of PVA with Undecenoyl chloride was found. The new idea was to modify directly the PVA used at the surface of the release liner paper.

This idea has been proposed to the Ahlstrom's Innovation Team different time before it has been accepted.

Technology: to use a long aldehyde chain with a vinyl function at one end



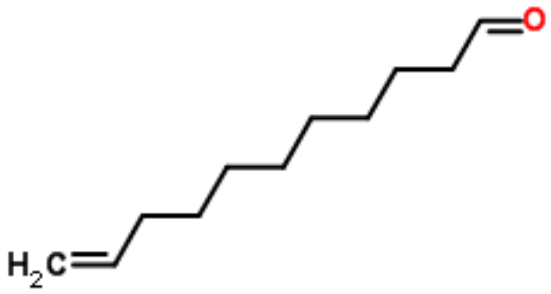
The way to ActiV

Final step

Difficulty: need to get a long aliphatic chain in order that vinyl group are available for reaction => no solubility in water. BUT Ahlstrom'paper machines were not equipped to work with solvent based materials.

Solution : In 2008, two chemists of the Research Center pushed the idea that heterogenic reaction was possible in water and this was confirmed by a Japanese patent.

The most suitable fatty aldehyde with vinyl group was undecenal due to its industrial availability



The way to ActiV

Final step

2009 : new development product project has been open in Ahlstrom

- First results gave unexpected results
  - Reduction of platinum needs
  - Improvement of rubb off in humid conditions
  - Higher reaction speed
- Decision to patent this technology : **new patent was filed the 23rd of February 2010**
- Industrialization of the technology first in Mathi (Italy) mill
- 2011 : launch of new ActiV product on the market
- 2014 : Ahlstrom-Munksjo awarded as Supplier of the Year by Avery Dennison
- 2016: >95% of Ahlstrom-Munksjo' production was ActiV technology
- ActiV is recognized as a top class product without any equivalence by the market and all the players

The way to ActiV

Conclusions

What are the reasons of the success?

- An obstinate team : more than 11 years between first idea and industrialization
- A stable team : the same people worked on the project from the beginning to the end but reinforced with time by new actors and new ideas
- Vision of the management : the idea has been rejected twice in 2006 and 2007. In 2008 a new manager finally gave the green light to the development
- Some chance : good adequacy between the market needs, the existing technologies and the scientists ideas

And finally the willingness of all a company to bring a breakthrough technology to the market

Obstinacy is the path to success (Charlie Chaplin)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