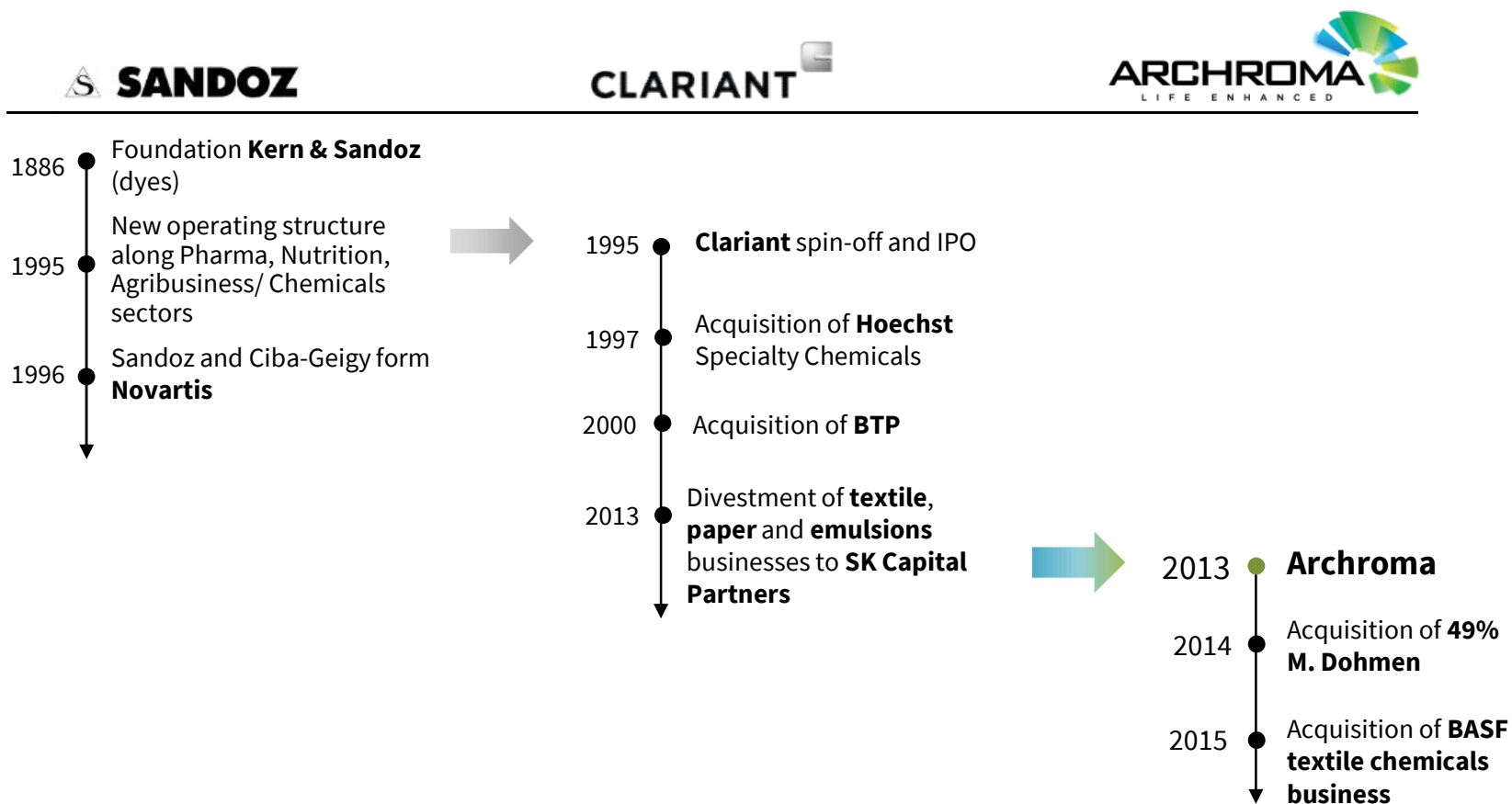


SUSTAINABLE SPIN FINISH CHEMICALS

Associazione Italiana di
Chimica Tessile e
Coloristica
October 2016



Introduction, History of Archroma





Archroma, a global leader in specialty chemicals across the textile, paper and emulsions sectors

/ Textile Specialties

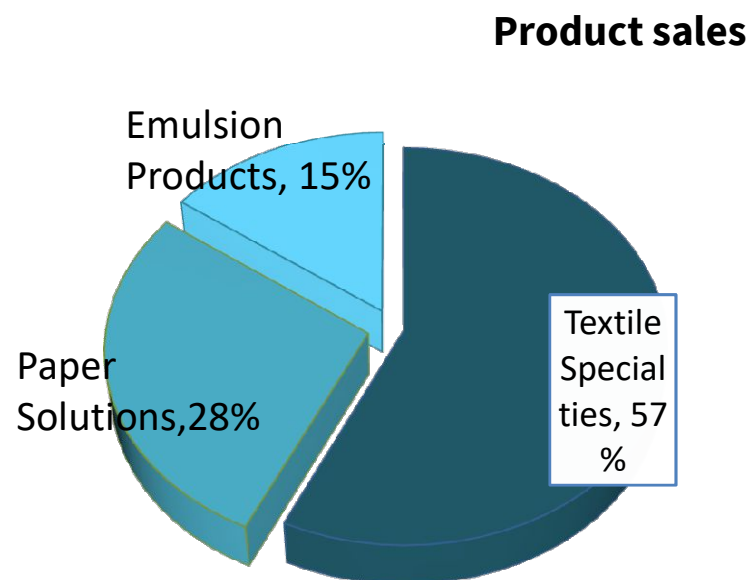
Global leader in textile chemicals and dyes

/ Paper Solutions

Leading provider of colorants, optical brightening agents, process and surface chemicals

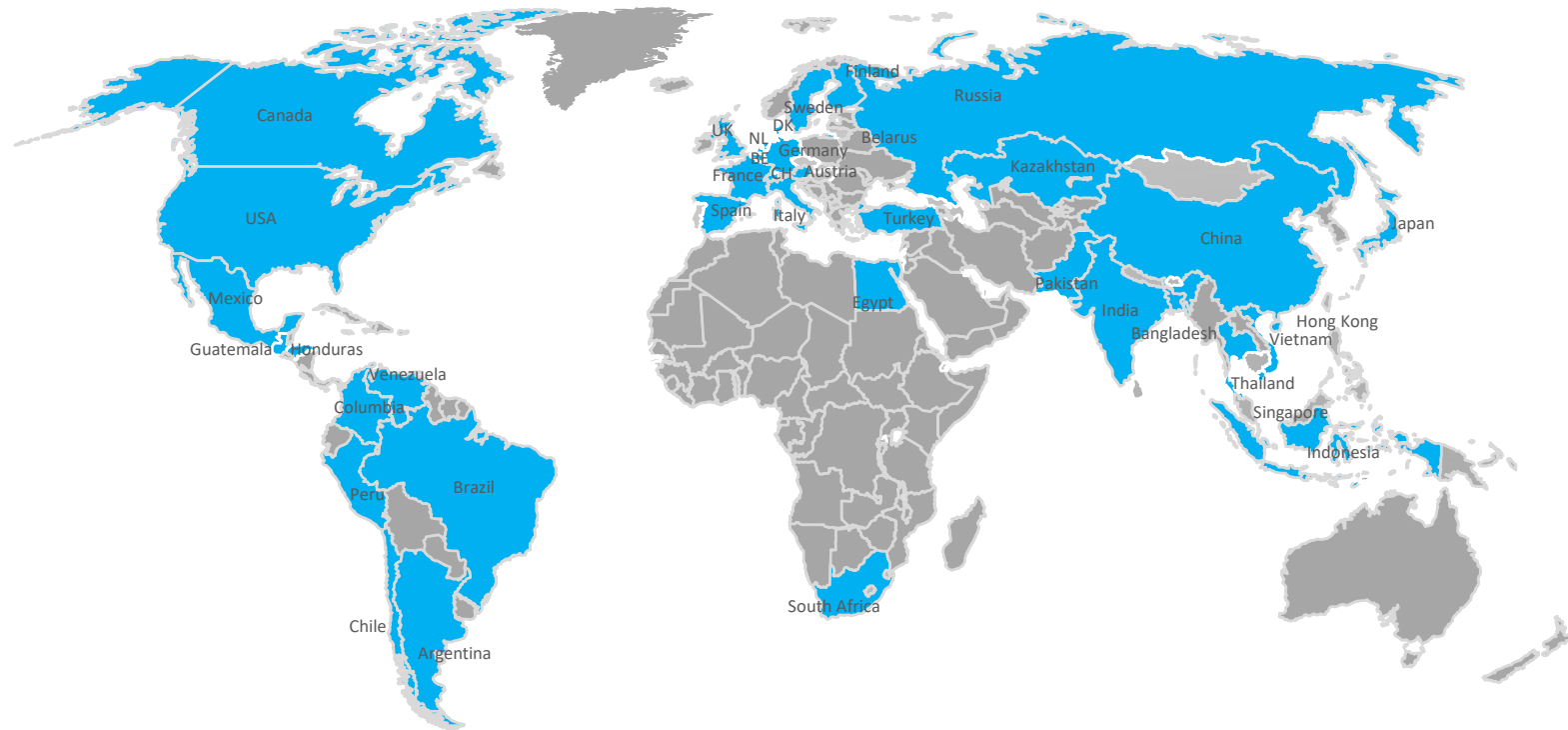
/ Emulsion Products

Leading provider of specialty emulsions to paints, adhesives, construction and the textile, leather and paper sectors



Archroma presence worldwide

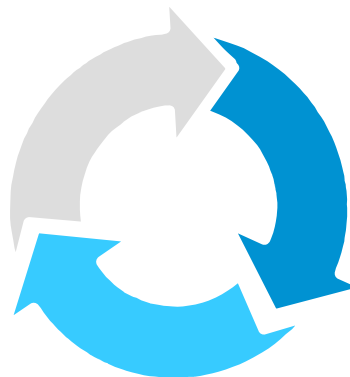
One global technology platform / with 25 production sites



An industry with exciting challenges and opportunities

Sustainable products and processes

- Increasing demand for eco-friendlier chemicals and dyes
- Growing awareness of environmental impact
- Compliance with regulations and standards



End user driven innovation

- Globalization and urbanization
- Increasing standards of living and consumption in emerging markets
- Growing recycling trend

Cost optimization in end markets

- Ongoing restructuring by developed market players
- Relocation to lower cost regions
- Production outsourcing to Asian producers

Commitment to sustainability

- Strong support for and focus on compliance to eco-standards:
 - REACH
 - TSCA
 - BfR
 - FDA
 - Oeko-Tex[®]
 - Bluesign[®]
 - GOTS
 - ZDHC
 - EU Ecolabel
 - Nordic Swan
 - Blue Angel
- Committed to Safety, Environment & Health as a fair and responsible company and employer

Regulatory Requirements

- Risk Assessments:
 - Hazard: testing, prediction methods, read across
 - Exposure: workers , environment, consumers
- Consortium & SIEF management / communication in EU
- Control of regulated substances: SVHC, California Prop 65...
- Sensitive uses specifically regulated:
 - Cosmetic
 - Biocides
 - Medical devices
 - Food contact
- Emerging Product Stewardship Issues
 - Nanotechnology
 - Endocrine...
- Emerging Articles Regulations / Textile regulation
- Hazard Communication: SDS/Label Authoring ; GHS Compliance EU, US, Korea

The PG FIBER

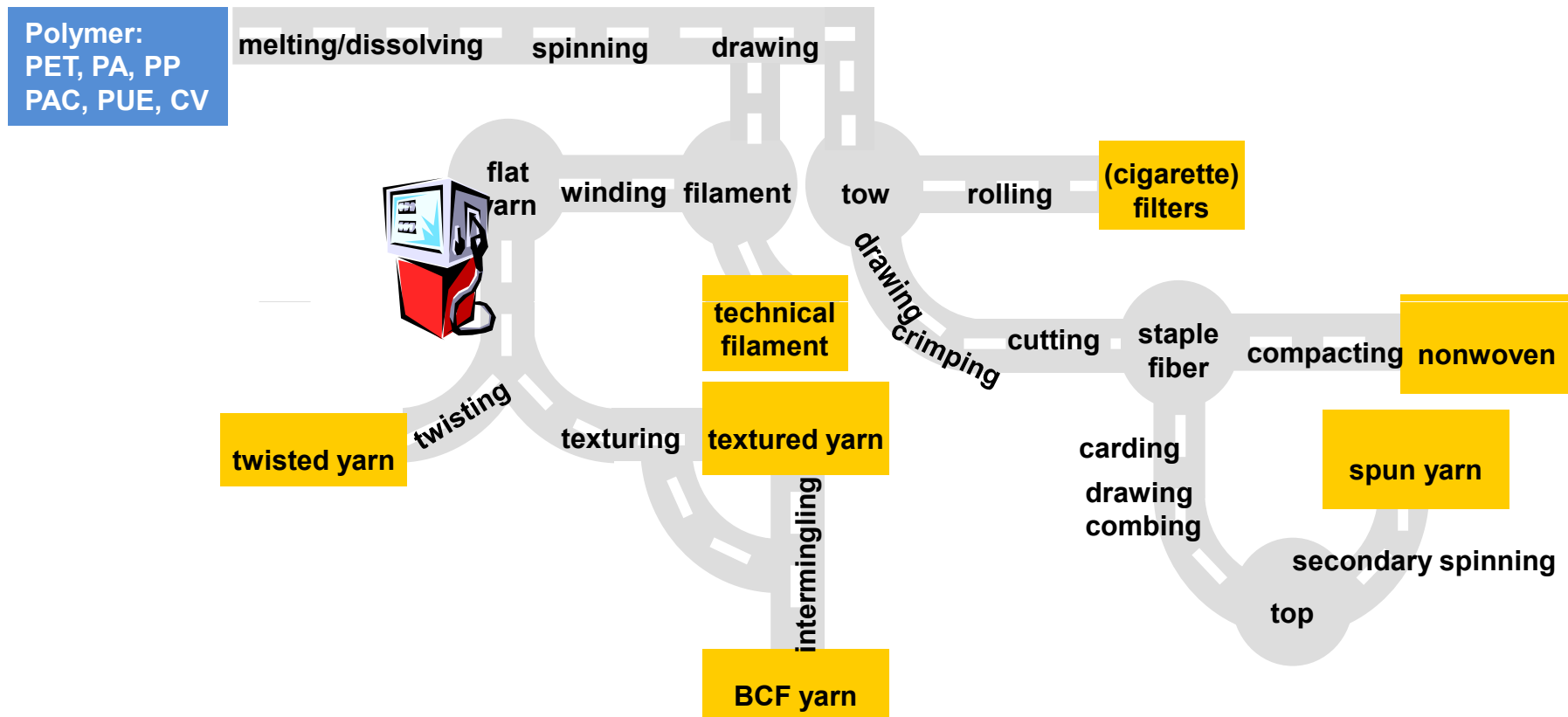
- developing and trading of products for production and processing of fibers and filaments in form of
 - Ready-to-use standard products
 - Taylor made solutions
 - Basic components

... for all kind of natural and synthetic fibers/filaments.

Standard range of spin finish products

		PET	PA	PP	CV	PAC	
filament	preparations	Afilan TPE	X				POY-DTY
		Afilan MTF	X				POY-DTY micro
		Afilan PFE	X	X			FDY
		Afilan RSN	X	X			technical, neat oil
		Afilan TCE	X	X			technical, emulsion
		Afilan AAY	X				activator
		Afilan JSW		X			POY, HT
		Afilan NBF-M		X			BCF, neat oil
		Afilan FOX			X		BCF
		Afilan SM				X	textile
		Leomin LS-N				X	technical
		Leomin AC80				X	modifier
		Afilan ZS				X	anticlogging
staple fibre	antistatic	Afilan SPC	X			X	long chain
		Leomin PN	X			X	medium chain, FDA
		Afilan PAT					X cationic, overspray
		Leomin AN				X	X anionic
	cohesion/Lubricant	Afilan HSGV	X			X	X nonwoven
		Afilan PTU	X				high cohesion
		Afilan MF3	X				cohesion, lubricity, FDA
		Afilan RA					X cationic, soft
		Leomin LS-N	X			X	X high cohesion
		Leomin AC80				X	modifier
		Afilan ZS				X	anticlogging
		Afilan CVS				X	textile
		Afilan BBA			X		nonwoven, needle punch.
	other applications	Afilan REL	X				fibre fill
		Leomin AFK					X internal softener
		Leomin OR	X	X	X	X	X cohesion component
		Hostaphat FL340N	X	X	X	X	X allround antistatic
		Afilan TXE	X	X	X	X	X emusifier for mineral oil

The Road To Different Spin Finish Products



Each manufacturing technology needs their own specific spin finish product including different requirements

What are spin finish products?

Requirements on spin finish products are quite high and very complex because each type of man made fiber has his specific technology and the spin finish product must be adjusted accordingly.

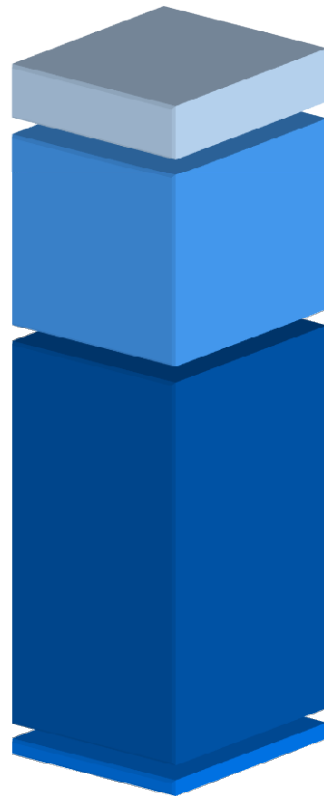
Most of the time less than 1% on weight of a spin finish product is applied on fibers or filaments.

Some basic requirements on a spin finish product are:

- Excellent spin finish distribution on yarn surface
 - Wetting and spreading
- Excellent thermo stability
 - up to 250°C, deposits or smoke
- Adjust friction, abrasion
- Minimize electrostatic charge
- Anticorrosive
- No yellowing
- Biological degradable
- Non toxic

What are spin finish products?

Spin finish products are most of the time blended products based on a complex mixture of different components as shown in the example of a flat yarn spin finish product:



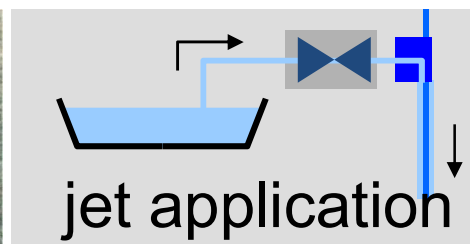
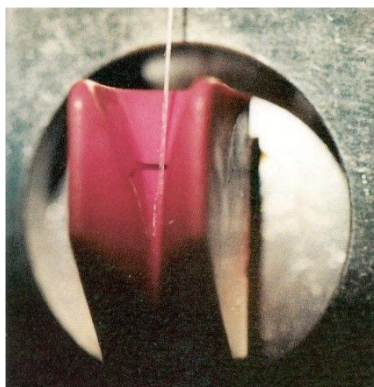
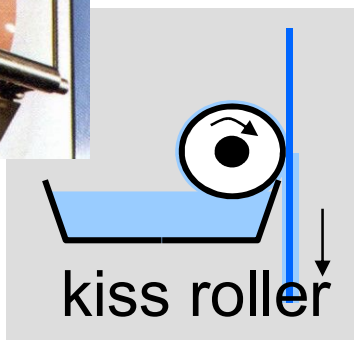
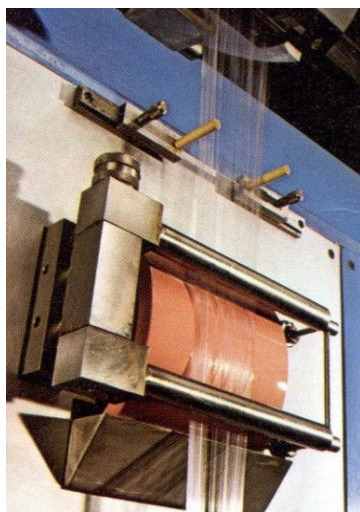
Antistat (~ 5 - 10 %)
(phosphonates, P_2O_5 -esters, sulfonates)

Emulsifier (~ 30 - 40 %)
(nonionic surfactants in general)

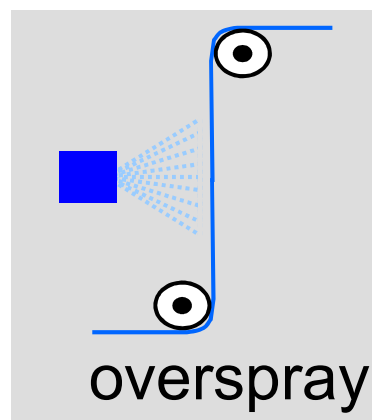
Lubricant (~ 50 - 60 %)
(synthetic esters, polyalkylene glycoles)

Functional additives (< 1 - 2 %)
(like e. g. wetting additives, cohesive agents, preservatives, anti oxidants or „Lowick“ additives)

The Way Of Application



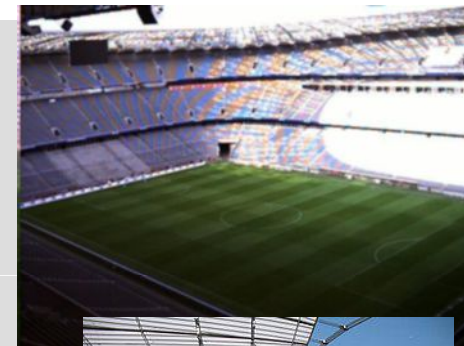
- aqueous emulsion (0.1 to 20%)
- neat oil



The Art Of Application Of Spin Finishes...

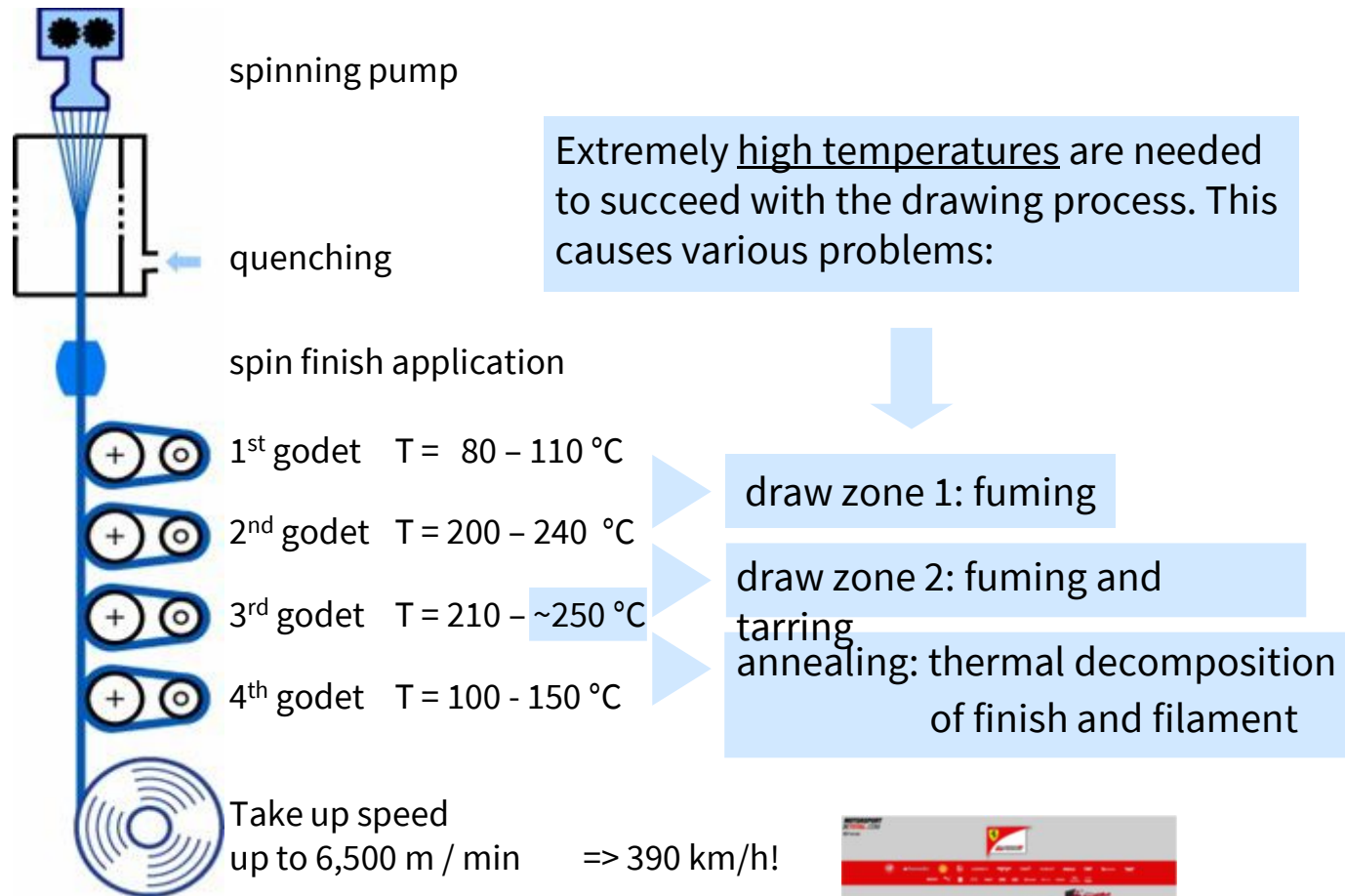
... is to distribute a small glass of beer

homogeneously on two soccer fields ...

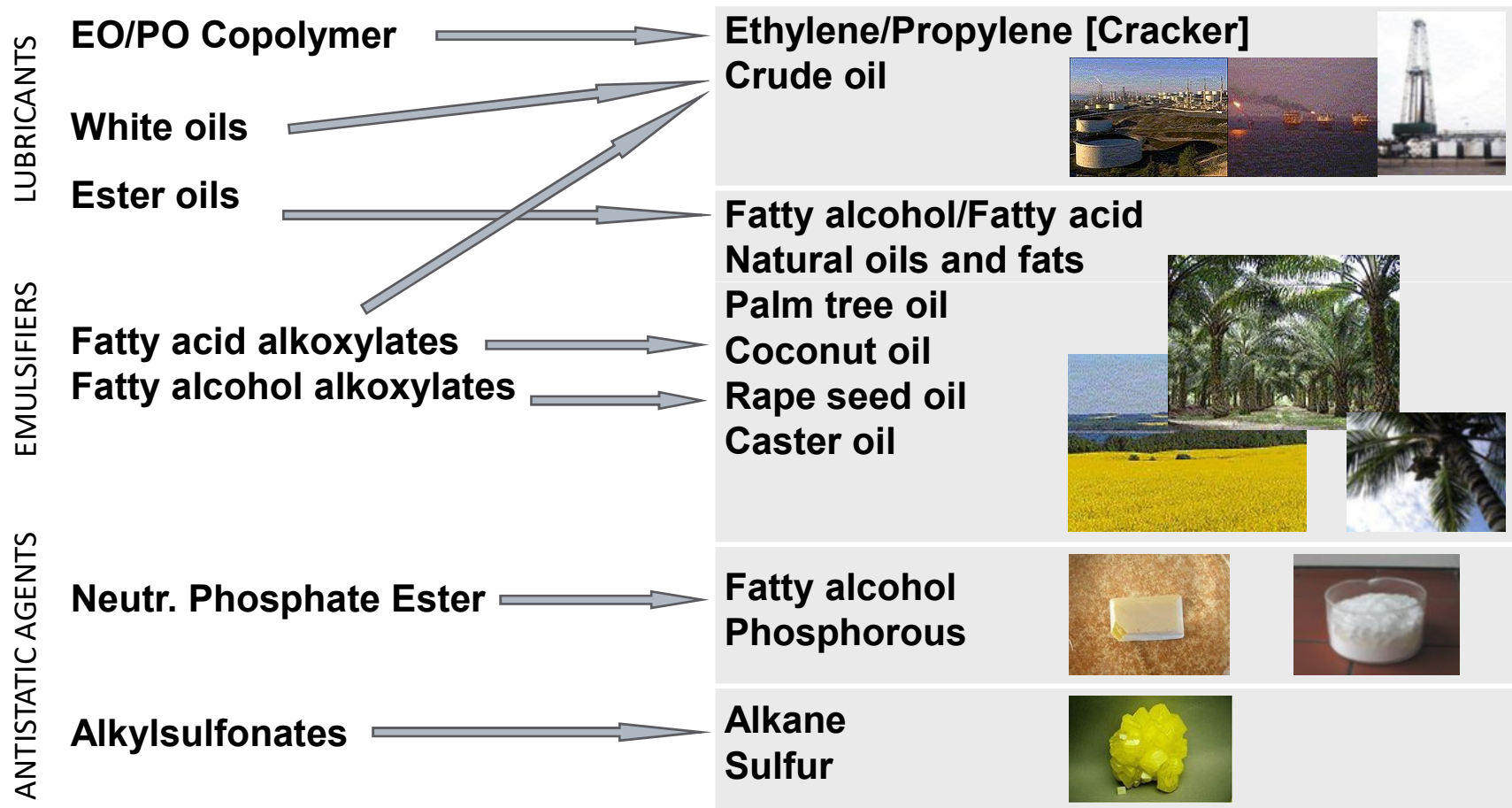


... to get a single bale of fiber

Example, Industrial yarn

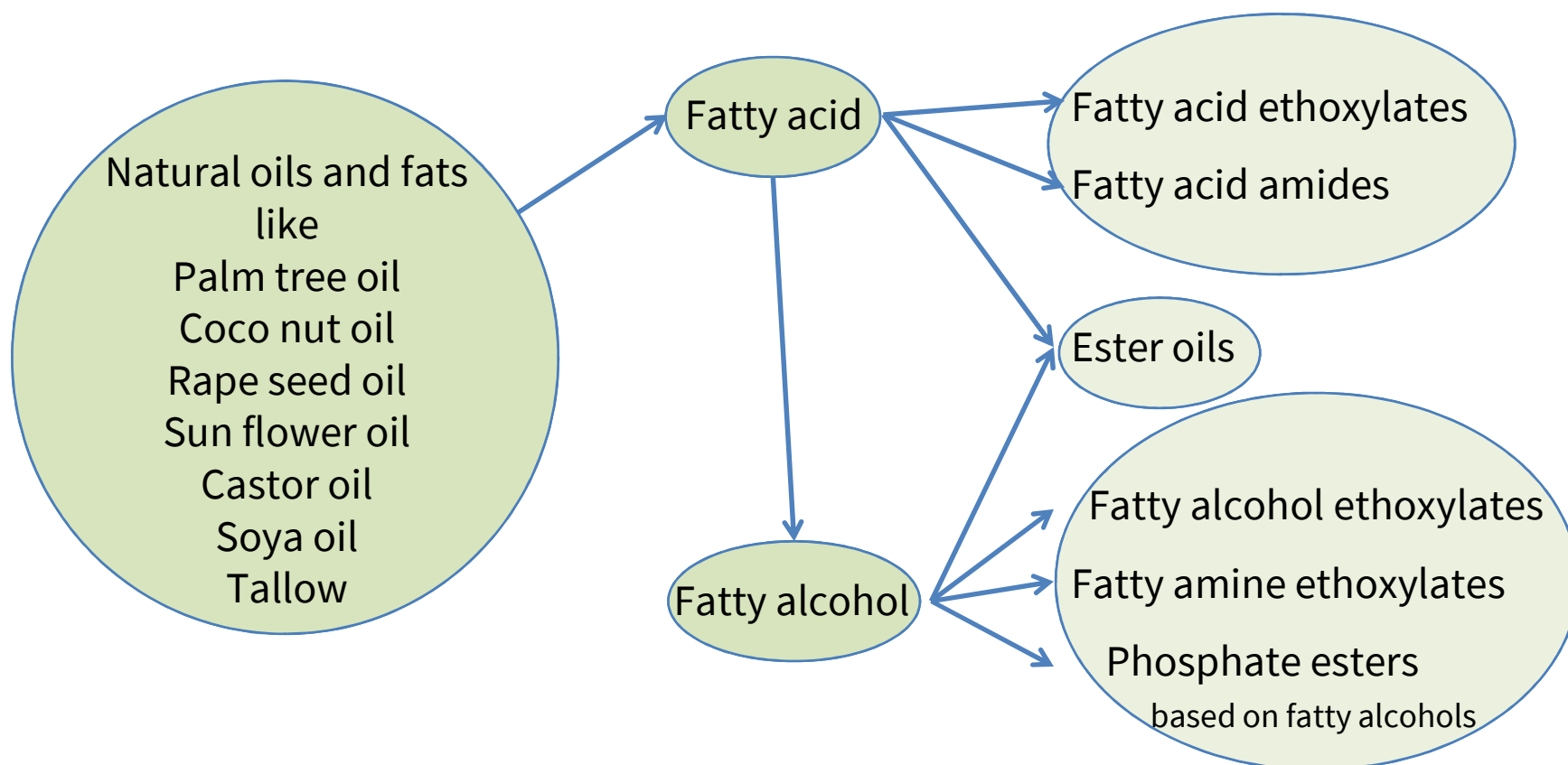


Spin Finish chemistry and associated basic raw materials



Spin finish products and linkage to renewable components

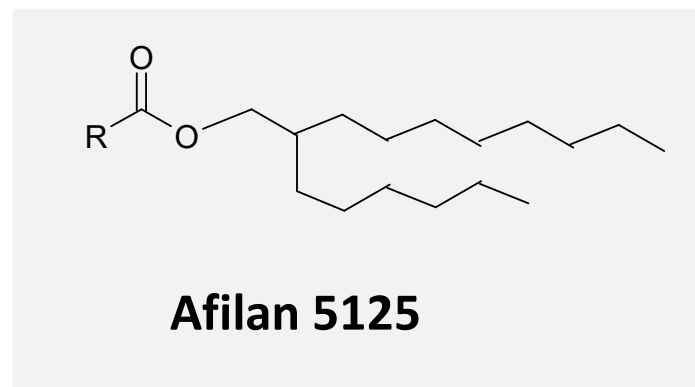
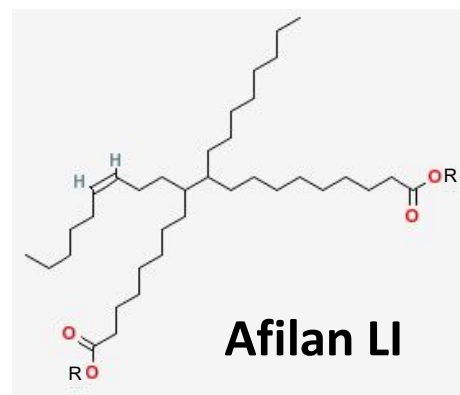
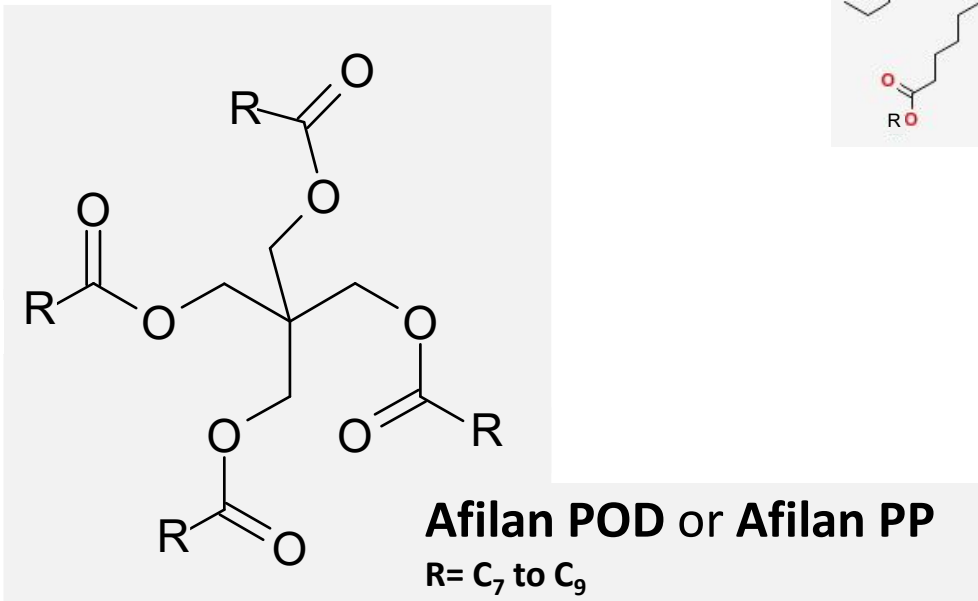
Some examples for basic raw materials needed for the manufacture of sustainable spin finish products and their principle sources:



Chemistry of spin finish components Lubricants

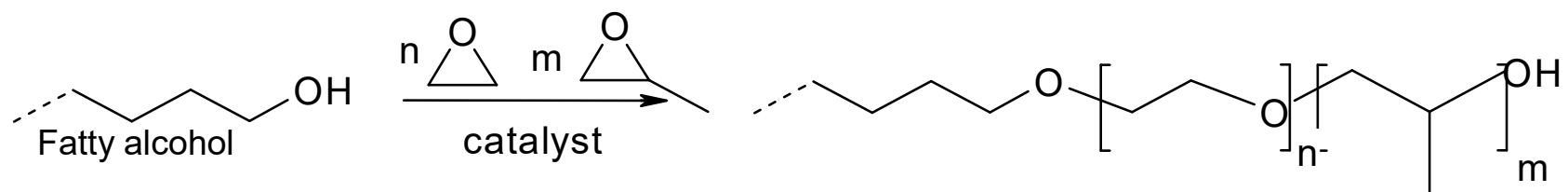
Synthetic esters

Thermostable ester oils
for high temperature spin finishes



Chemistry of spin finish components

Fatty alcohol alkoxyates

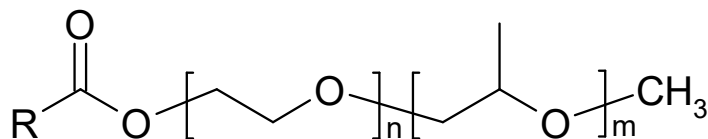


	Polarity, Water solubility	Cloud point	Solidification point
Length of alkyl group	↙	↙	↗
Branch of alkyl	↗	↗	↙
Length of EO chain	↗	↗	↙
Ratio EO/PO	↙	↙	↗

Chemistry of spin finish components

Fatty acid alkoxylates

endcapped esters



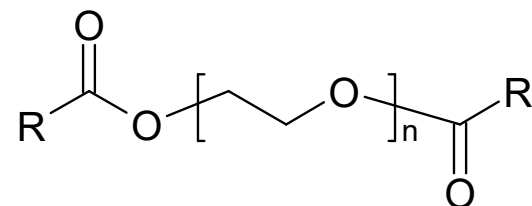
Afilan PTU

(with R = Oleyl- (animal))

Afilan V5066

(with R = Oleyl- (vegetable))

diester compounds



Leomin OR

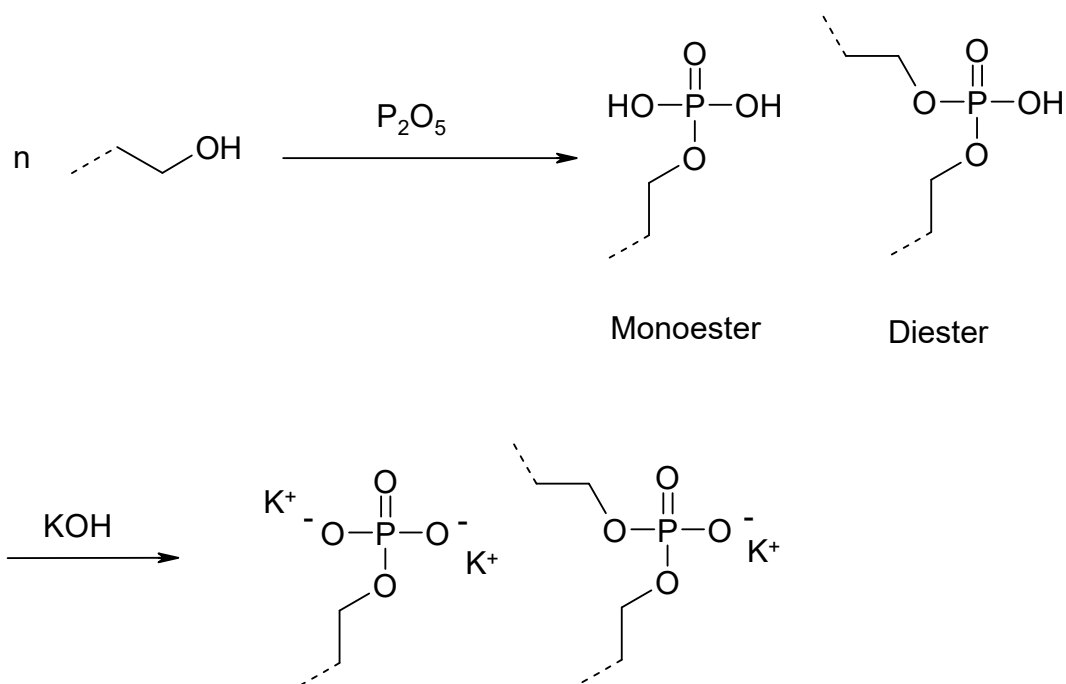
(with R = Oleyl-)

Afilan CD

(with R = Cocoyl-)

Chemistry of spin finish components

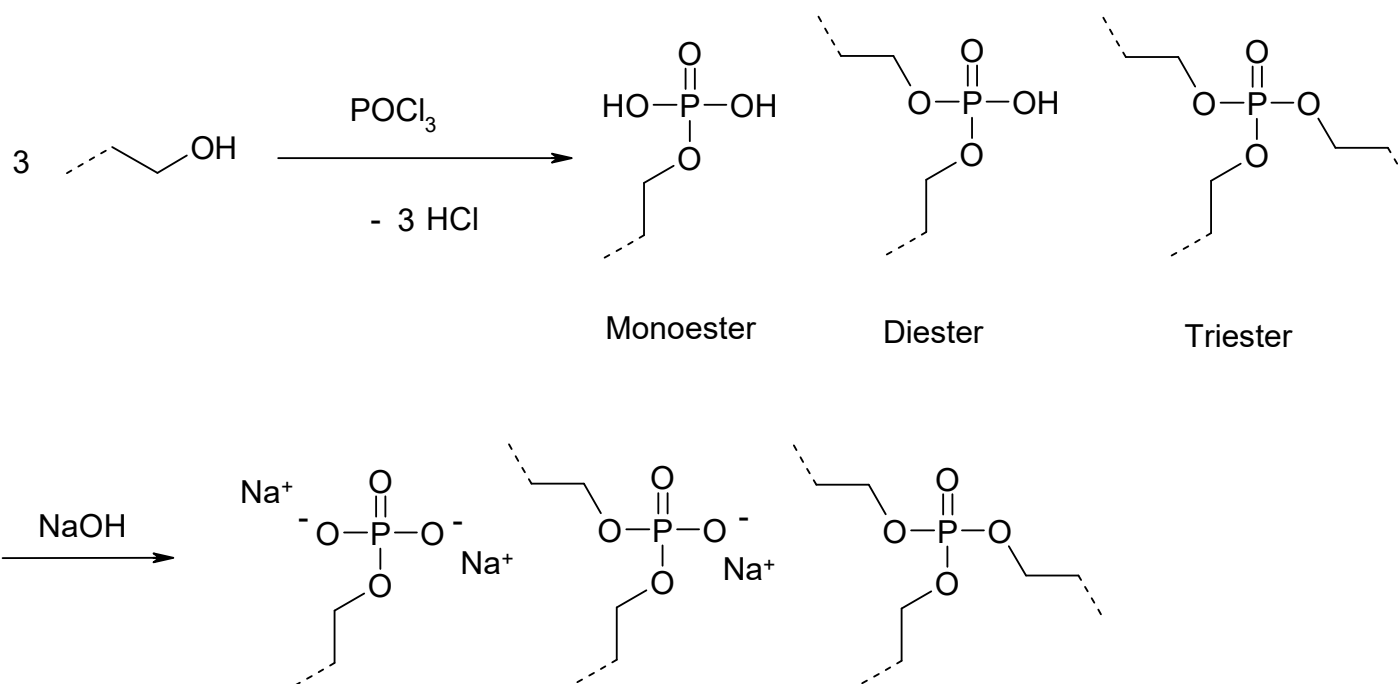
Phosphate esters based on Phosphorous pentoxide



Afilan AKT, Leomin PN, Afilan SPC
antistatic properties, hydrophilicity, climate

Chemistry of spin finish components

Phosphate esters based on Phosphorous oxichloride



Afilan FL340N, Afilan W327
thermo stable antistatic agents, emulsifier, cohesion agent

Spin finish products and linkage to renewable components

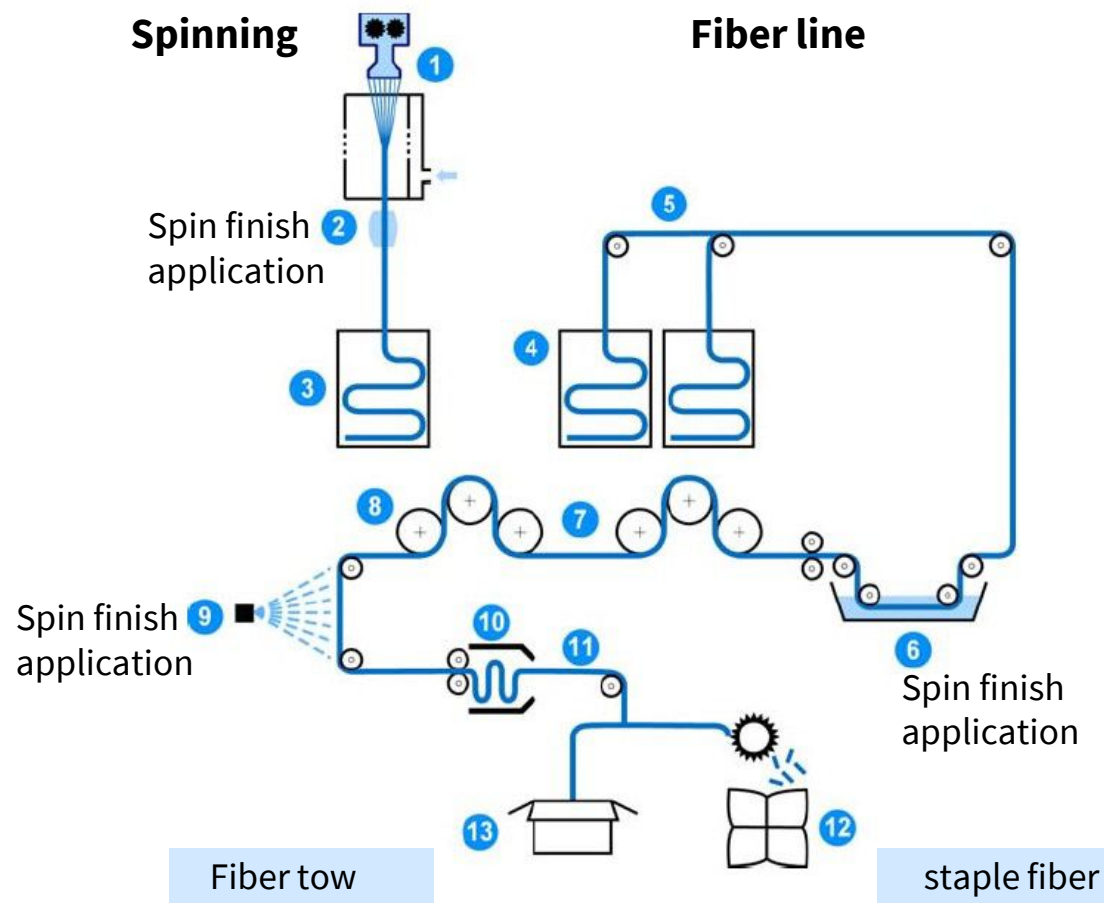
- From the examples showed before in that presentation it can be seen that in general all introduced components are based on aliphatic organic chemistry.
- For the manufacture of these components the principle source can be fats and oils from renewable sources.
- This is now the key to develop ecological friendly products because there are different possibilities to select components based on

❖ **renewable source**

or

❖ **crude/mineral oil.**

Examples, staple fibers



Spin finish products:

➤ Afilan V5066

➤ Leomin PN

ratio: 50:50 to 30:70

Examples, staple fibers

Percentage of spin finish components based on renewable materials/sources:

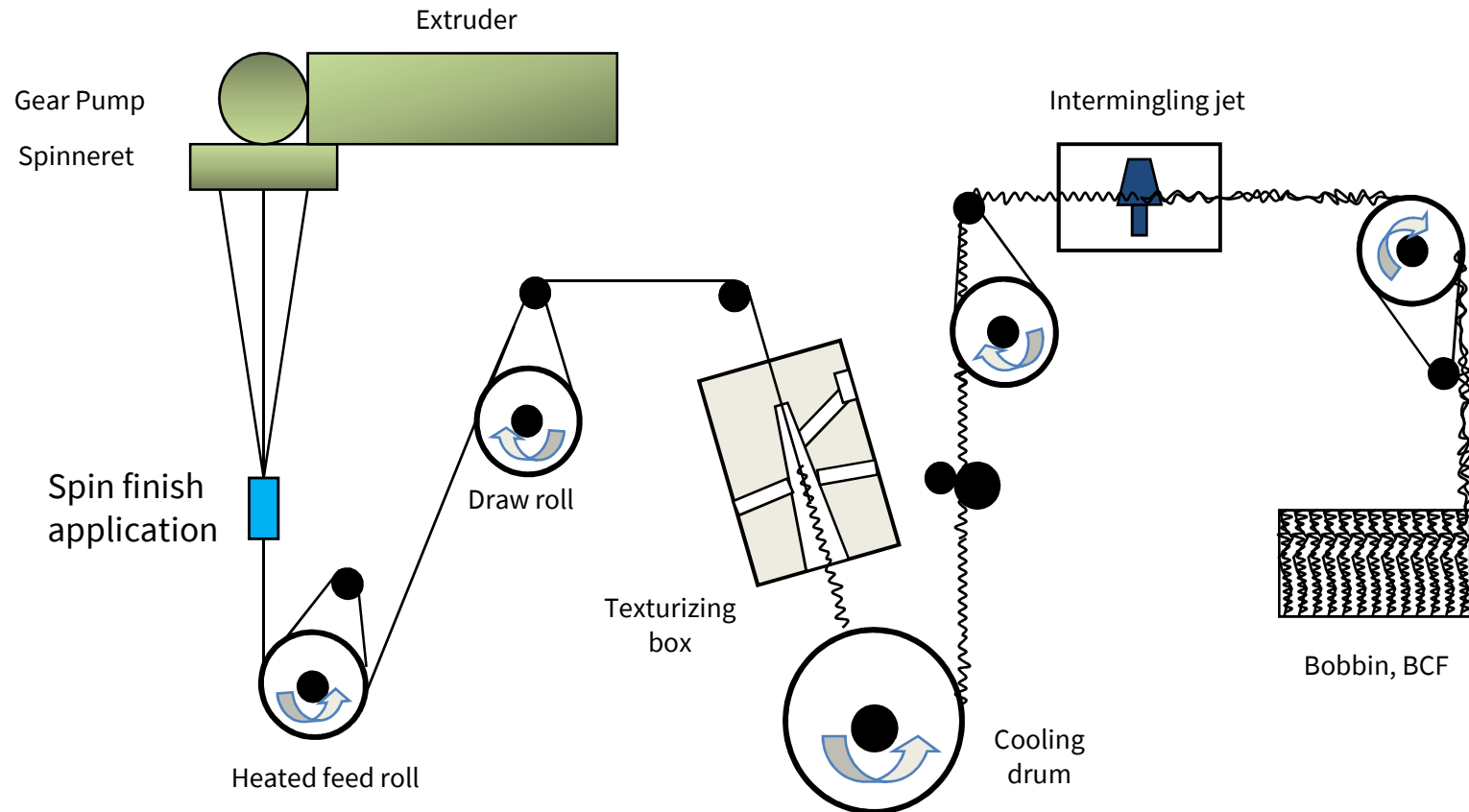
	Part based on renewable source*	Biodegradability**
Afilan V5066 liq.	approx. 34 %	> 80%
Leomin PN pa.	approx. 72 %	> 80 %

*: calculated result is based on active material of the spin finish product.

** : OECD 302B, 28 days or estimated value as the result of the calculation method (based on values of OECD 302B, 28 days, measurement results).

Examples, Bulky continuous filament, BCF, for carpet production

Exemplary spin-draw texturing process



Examples, Bulky continuous filament, BCF, for carpet production

Percentage of spin finish components based on renewable materials/sources

	Part based on renewable source*	Biodegradability**
Afilan FOX liq. (for PP-BCF)	approx. 33 %	> 80 %
Afilan NBF-M (for PA-BCF)	approx. 57 %	> 75%

*: calculated result is based on active material of the spin finish product.

** : OECD 302B, 28 days or estimated value as the result of the calculation method (based on values of OECD 302B, 28 days, measurement results).

Summary

- Spin finish products are high sophisticated lubricants.
- Non of the state of the art processes for the manufacture of man made fibers and filaments will be able to work on a high productivity or efficiency level without using a spin finish oil.
- These spin finish oils are most of the time applied on a quite low quantity level of less than 1% and this quantity is responsible for an efficient running process.
- Therefore, excellent quality and consistency are key parameters for success in this application field.

Summary

- Beside the technical issue since years ecological questions can not be forgotten anymore.
- Therefore the use of spin finish components based on renewable materials should be considered where ever possible.
- Beside this, a good biodegradability is another key parameter for ecological friendly products.
- Thinking over all on sustainability, I hope the given examples of our Archroma spin finish products show that we are aware about the responsibility we have for our environment and combined with the high quality standard of our products we built the basis for a trustful cooperation with all our business partners.

Summary

Thank you very much for your attention!



Sustainable
Spin finish products
and
Chemistry in use



juergen.weigel@archroma.com