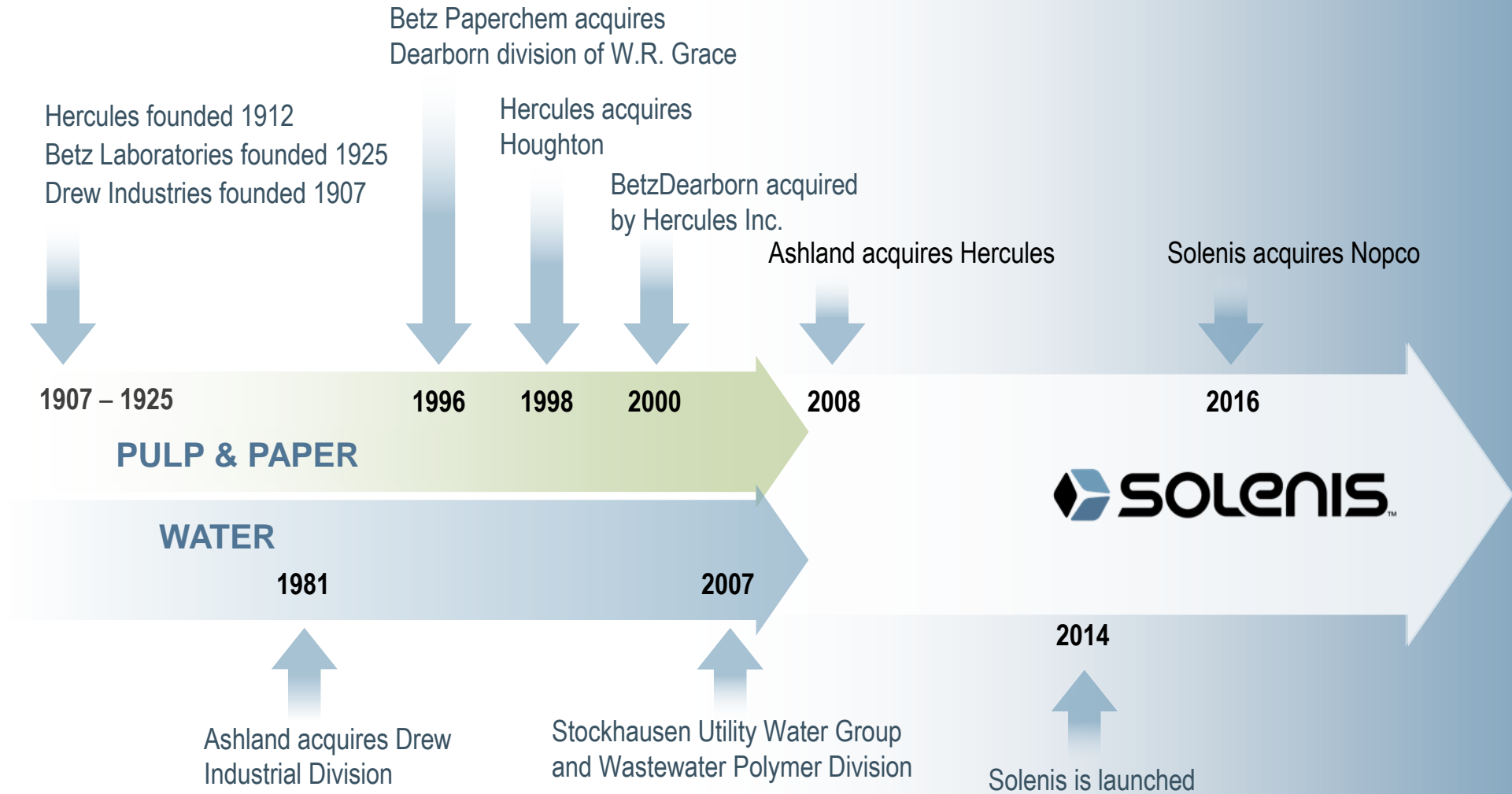


Solenis

A Leading Speciality Chemical Company and Provider of Process and Water Solutions

Solenis

A HISTORY OF TRUSTED PARTNERS



Solenis

WORLD-CLASS SOLUTIONS FOR GLOBAL INDUSTRIES



4 • Confidential and proprietary.

INDUSTRIAL CHEMICALS

- Process
 - Defoamers
 - Demulsifiers
 - Rheology modifiers
 - Collectors
 - Drainage aids
 - Enzymes
- Functional
 - Wet and dry strength
 - Surface treatments
 - Barrier coatings
 - Adhesives
- Water Treatment
 - Deposit control
 - Flocculants
 - Corrosion inhibitors
 - Scavengers
 - Coagulants
 - Fuel additives
 - Biocides



Possibilities with Process Chemicals

Process Chemicals are used to enhance industrial processes

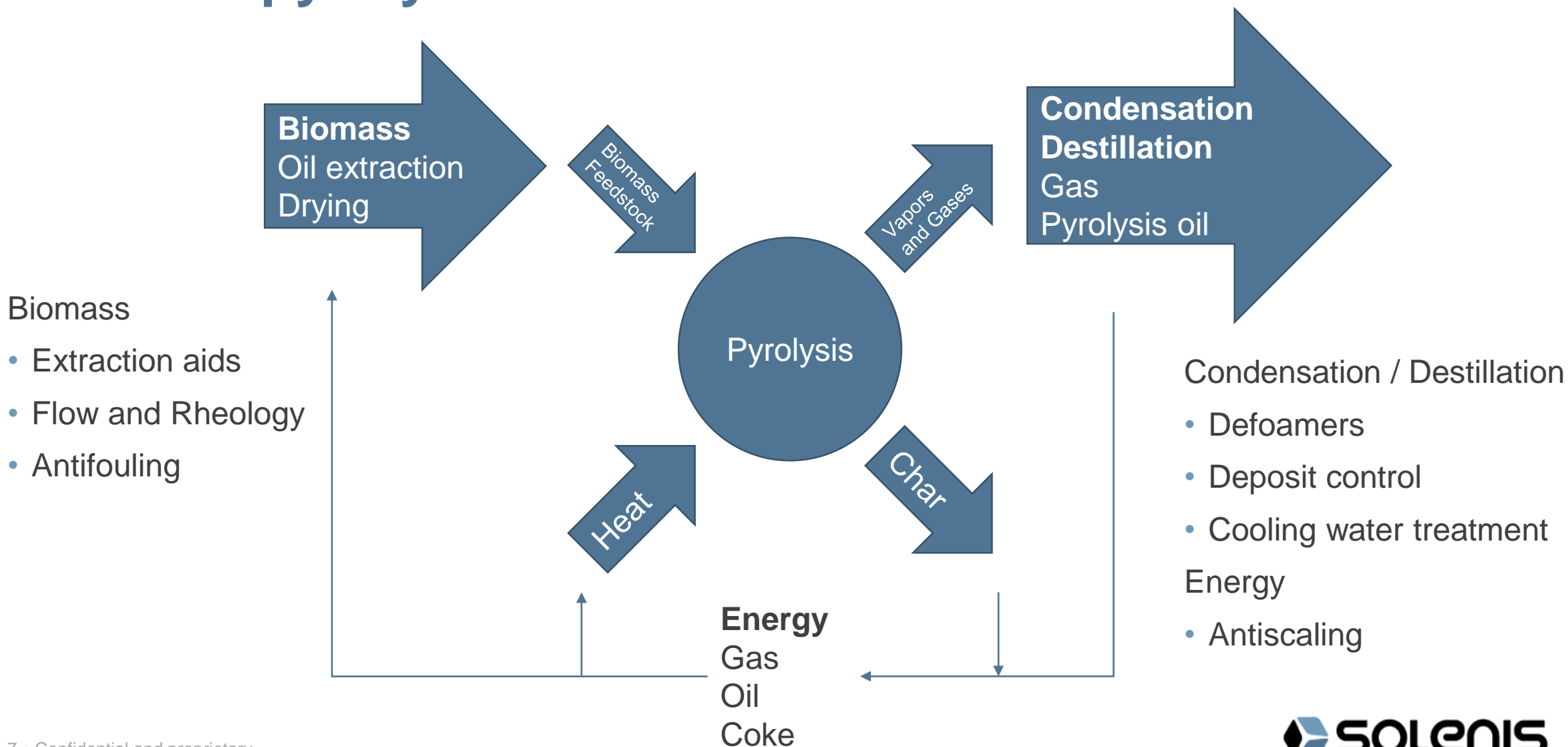
- Runnability
- Product quality
- Process speed
- Maintenance stops
- Debottlenecking



Process Chemicals

- Antidusting agent
- Antifoaming agent
- Antifouling agent
- Antioxidant
- Antistatic agent
- Bleaching agent
- Biocide
- Catalyst
- Chelating agent
- Coagulant
- Collector
- Complexing agent
- Corrosion inhibitor
- Demulsifier
- Defoamer
- Detackifier
- Deaireator
- Debonder
- Deposit control agent
- Dewatering aid
- Digester aid
- Dispersant
- Drainage aid
- Dust suppresant
- Enzyme
- Extraction aid
- Felt conditioner
- Filtration aid
- Fixation agent
- Flocculant
- Flotation aid
- Odor control
- Release agent
- Retention agent
- Rheology modifier
- Scale inhibitor
- Scavenger
- Separation aids
- Viscosity modifier
- Washing aid
- Waste water treatment
etc

Biomass pyrolysis to Biofuel



POLYSTABIL™ SCALE INHIBITORS FOR FUEL ETHANOL PLANTS

Conventional technology

- Polyacrylates
- Limited by US FDA

Solenis Polystabil

- Blended product
- Works at lower levels
- Allows for higher dosages

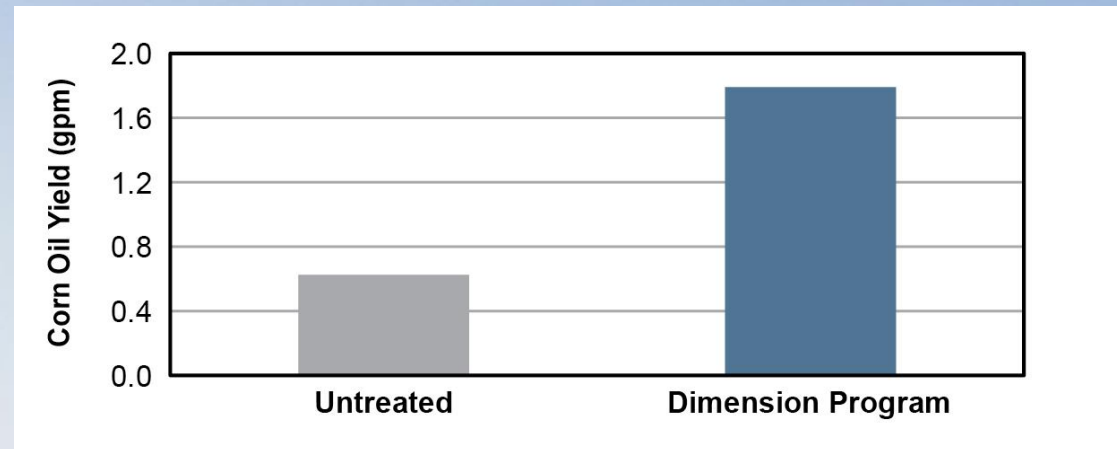
- Improved evaporator efficiency
- Reduced fouling and deposition
- Increased production
- Reduced energy costs
- Reduced downtime
- Shorter maintenance outages

DIMENSION™ CORN OIL EXTRACTION AID INCREASES CORN OIL YIELD AND IMPROVES CORN OIL QUALITY

A fuel ethanol plant located in the Midwestern United States installed a disk-stack centrifuge at great capital expense to extract corn oil from its process. However, the plant's anticipated corn oil yield was not being achieved and its return on investment was not being realized. In hopes of increasing its corn oil production and improving its return on capital, the plant agreed to trial a Dimension corn oil extraction aid. The following benefits were recorded during the trial:

- **Corn oil yield was increased by 200%**
- **Corn oil quality was improved**
- **Feed quality specifications were met**
- **System downtime was reduced**

Since permanently converting to the extraction aid, the plant has increased its corn oil production by more than \$1 million per year.



Digester

Scale control & deresination aid
Digester additive
Turpentine separation aid

Brown stock

Defoamer
Drainage aid
Pitch & Scale control

Drying machine

Pitch fixative
Pitch dispersant
Pitch detackifier
Felt conditioning
Drainage aid
Defoamer
Biocide

Wood handling

Defoamer
Chip packing aid

Recausticizing

Lime mud dewatering aid
Gypsum scale treatment
Green liquor polymer
Safe acid cleaning

Water treatment

Boiler water
Cooling water
Effluent polymer
Effluent defoamer
Cleaning
Scale control
Sludge dewatering

Evaporation

Soap separation aid
Tall oil separation aid
Defoamer
Scale control

Bleaching

Calcium Oxalate
Barium sulfate
Calcium carbonate
Defoamer
Pitch deresination aid
& Pitch washing aid
Enzyme : Xylanase
Safe acid cleaning

INFINITY PS4305

LIME MUD DEWATERING AID

DELIVERED BENEFITS

- ↗ Stabilization of lime mud %DS
- ↗ Lime production
- ↘ fuel consumption
- Less rings
- Less ring formation

PULP MILL

- SW continuous kraft mill 520 tpd
- Lime kiln capacity: 150T CaO/d
- Northern Europe
- Lime mud drum filter
- Conventional kiln
- Dryness 80% average

Customer Challenges:

- Standard deviation of Dryness outlet drum filter
- Fuel consumption savings
- Limitation in lime production

Solenis Solution & Results

- Solenis team proposed lime mud dewatering aid **Infinity PS4305**
- Optimized dosage inlet of lime mud washer (drum filter) 150 g/T vs CaO
- Lime production increased 3% with treatment with same residual CaCO₃ and fuel consumption
- Specific fuel consumption decreased 3%
- *Huge savings based on less purchased lime demand*



Production CaO T/day	150
Production increase	3%
Production increase T CaO/year	1575
Treatment cost €/year	24 570
Mill savings €/year	85 680
ROI	349%

INFINITY PS3040E

TALL OIL SEPARATION IMPROVEMENT

DELIVERED BENEFITS

- ↗ Tall oil production
- ↗ Tall oil quality
- ↘ Acid usage

PULP MILL

- 600 000ADT/d bleached market pulp
- Northern Europe
- Calculated Tall oil production about 120t/d
- **Tall oil is sold out**

Customer Challenges

- Tall oil separation without separation aid is insufficient
- Tall oil quality varies
- Customer used competitors separation aid but results were not fully satisfied

Solenis Solution & Results

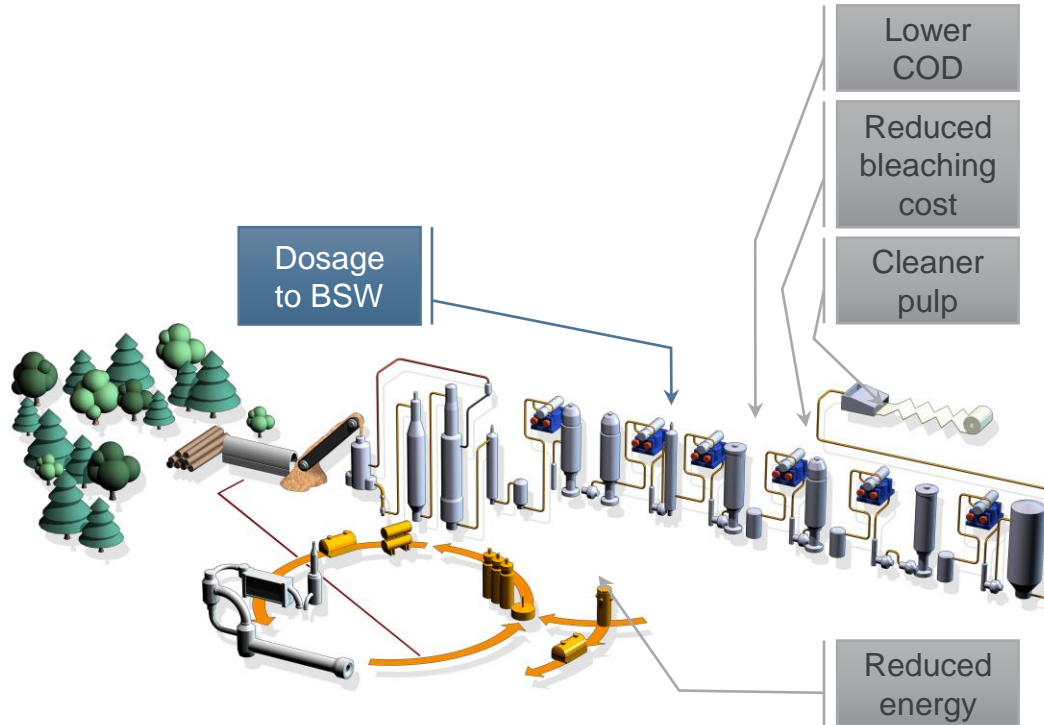
- Solenis proposed Infinity PS3040E (Rev 70k€/y)
- Product dosed to soap before acid dosing
- Dosage: 600ppm, treatment cost about 200€/d
- Higher production and less water in the final Tall oil to be sold out
- **Tall oil price is around 450€/t. Produced extra 20t/d means 9000€/d.**
- **Yearly benefit estimated for the customer about 1M€ (not full Tall oil production during the year)**



	Pulp production, t/d	Tall oil yield, %	Tall Oil t/d	Water content in Tall Oil %
Competitor	1499	40,90	92,01	1,31
No treatment	1678	36,12	83,90	1,21
Solenis	1622	44,59	109,96	0,95
No treatment	1720	36,65	86,99	1,22
Solenis	1627	39,36	93,75	0,95

Silicone emulsion defoamers

OVERVIEW



BENEFITS (NOT ALL OBSERVED AT ONCE)

• Defoaming

- Reduced surface foam
- Reduced entrained air
- More stable and continuous production
- Better washing efficiency
- Improved screening performance

• Drainage

- Better washing efficiency
- Reduction of bleaching chemicals consumption
- Lower water consumption
- Better environmental performance
- Improved pulp quality

• Pitch count reduction

- Cleaner pulp
- Reduction of offgrade
- Higher revenues
- Less additives (talcum, bentonite, etc)



History of Brown Stock Defoamers

< 1960s

- Control of overflow in washer vats
 - Kerosene
 - Fuel Oil

1950s – 1960s

- Formulated products for foam control
 - Mineral oil based defoamers
 - Silica
 - EBS wax
 - (Surfactants)

1970s – 1980s

- Water extended defoamers

1990s – present

- Silicone based defoamers
 - Silicone concentrates
 - Silicone emulsion defoamers

Late 1990s

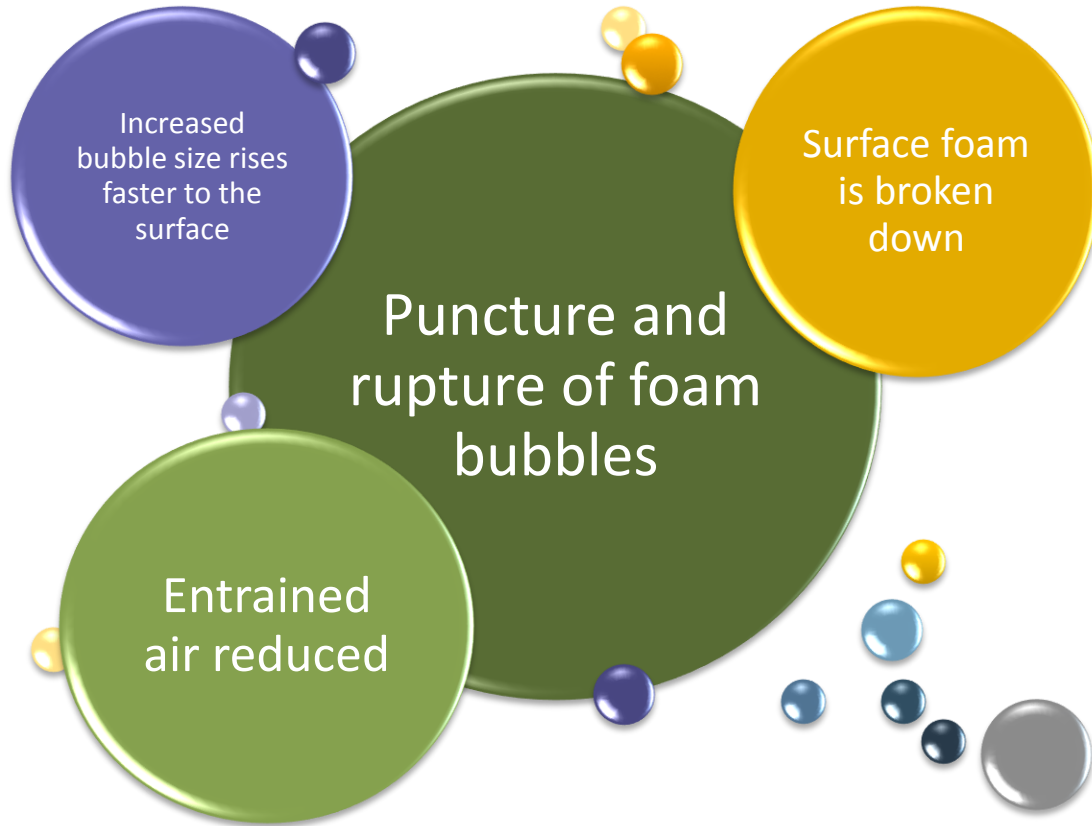
- Focus on food contact legislations
 - Improved silicone emulsion defoamers
 - White oil based defoamers

2010s – present

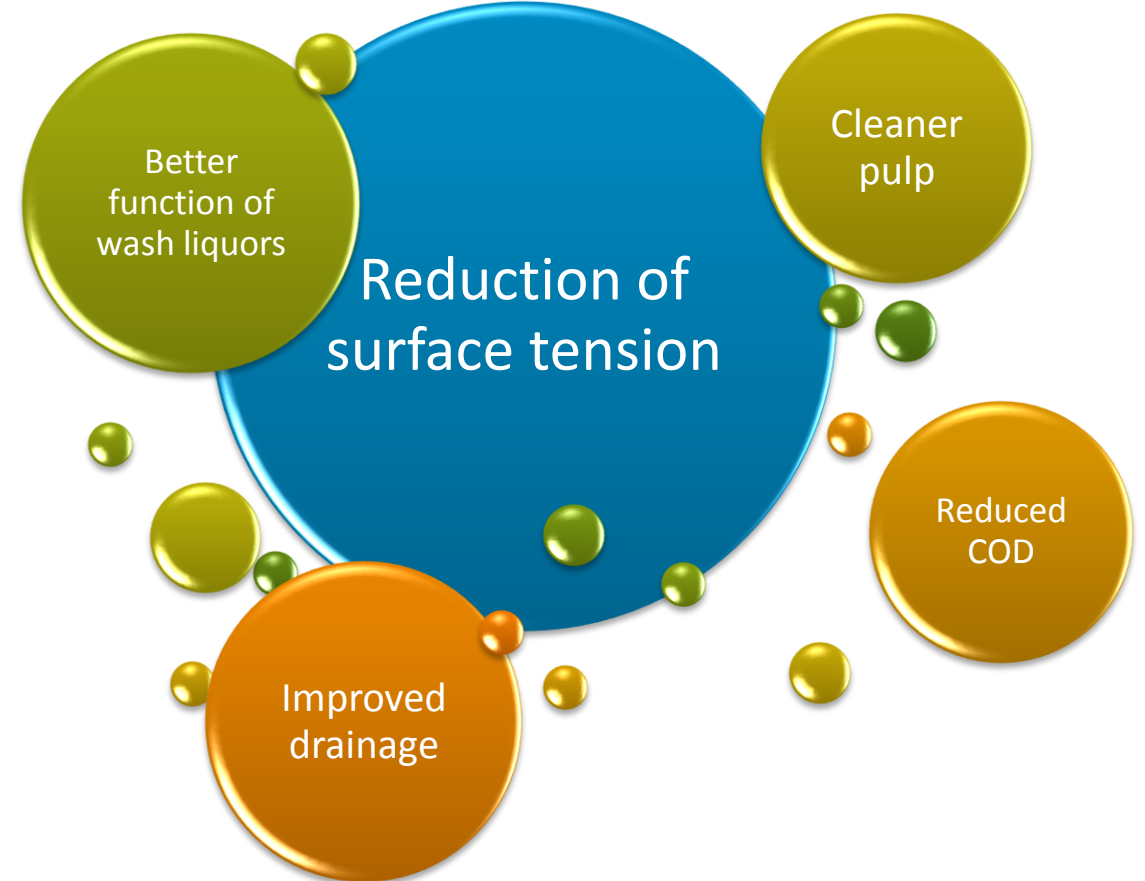
- Drainage boosters added

How does it work?

TRADITIONAL PULP DEFOAMERS



SILICONE EMULSION DEFOAMERS



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