DRY-ANIONIC SURFACTANTS

A valuable tool for the detergent industry

by

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- SULPHONATES and THEIR IMPORTANCE in the SURFACTANTS SCENARIO
- SULPHONATES PRODUCTION TECHNOLOGY
- DRY-ANIONIC SURFACTANTS PRODUCTION
- USE and ADVANTAGES of DRY-ANIONIC SURFACTANTS
- ECONOMICAL CONSIDERATIONS

ANIONIC SURFACTANTS

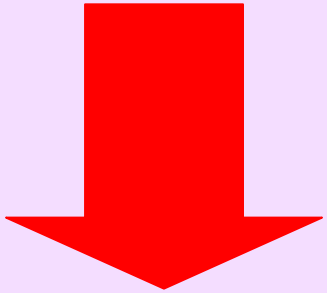
are the most widely used

ACTIVE COMPONENTS

because of their

⇒ Wide spectrum of applicability
⇒ Wide range of industrially available types
⇒ Consolidated manufacturing technology
⇒ Proven overall performances
⇒ Chemical compatibility with other detergent components

ANIONIC SURFACTANTS



SULPHONATES

⇒ LABS : Linear-Alkyl-Benzene-Sulphonate

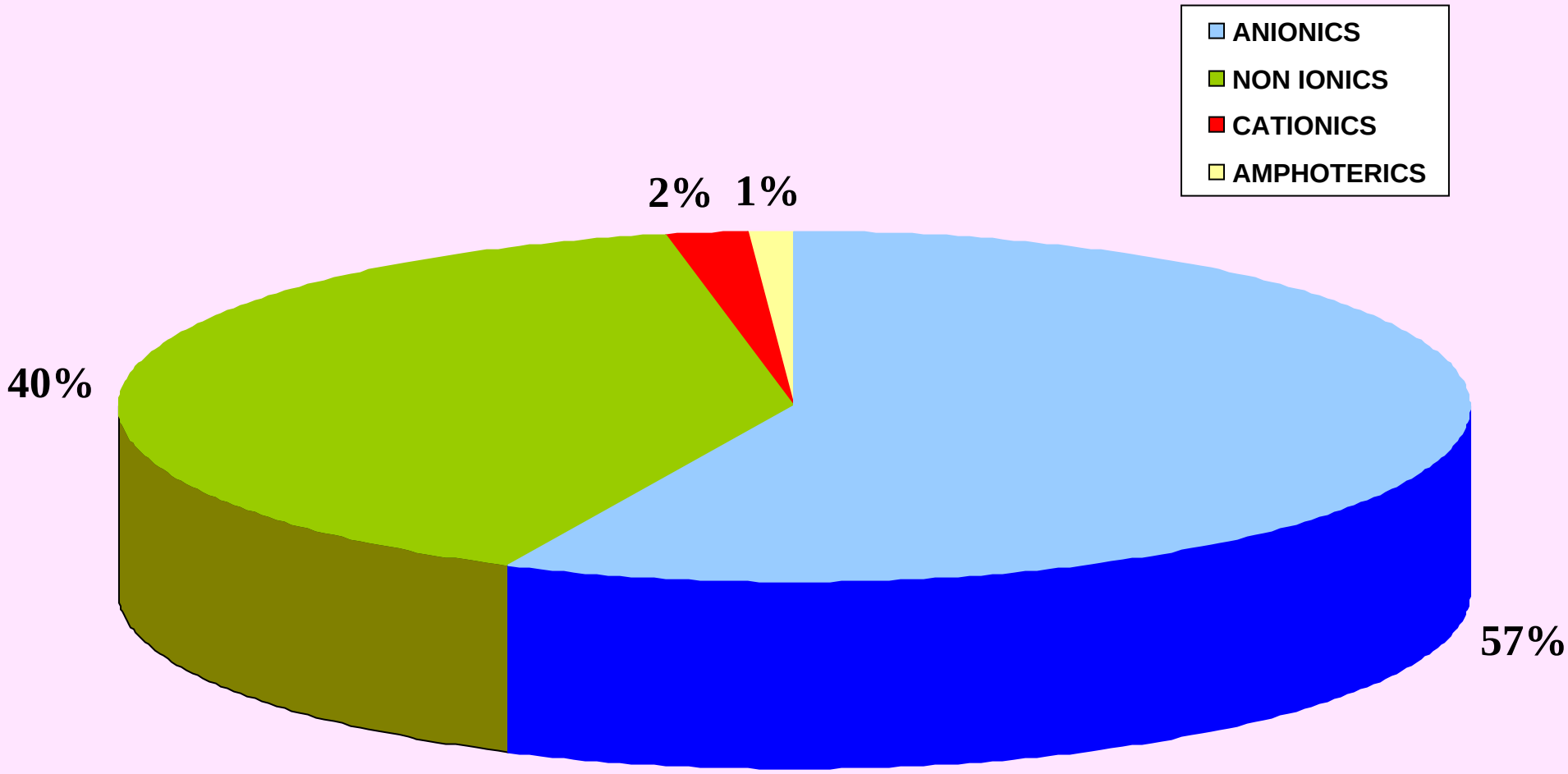
⇒ FAS : Fatty-Alcohol-Sulphates

⇒ FAES : Fatty-Alcohol-Ethoxy-Sulphates

⇒ AOS : Alpha-Olefins-Sulphonates

⇒ MES : Methylester-Sulphonate

SURFACTANTS USE
in
HOUSEHOLD and PERSONAL CARE PRODUCTS



ANIONIC SURFACTANTS USE
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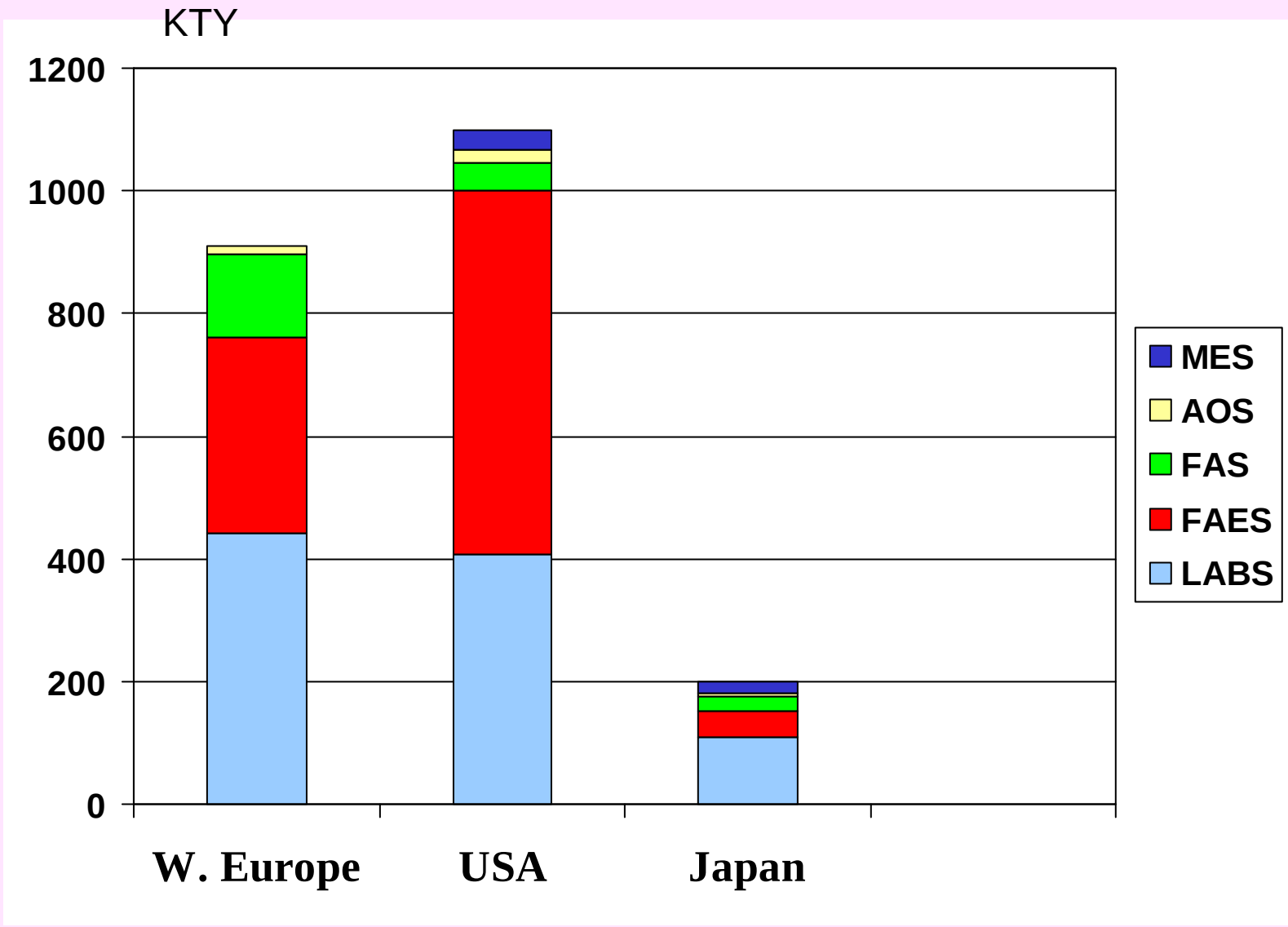
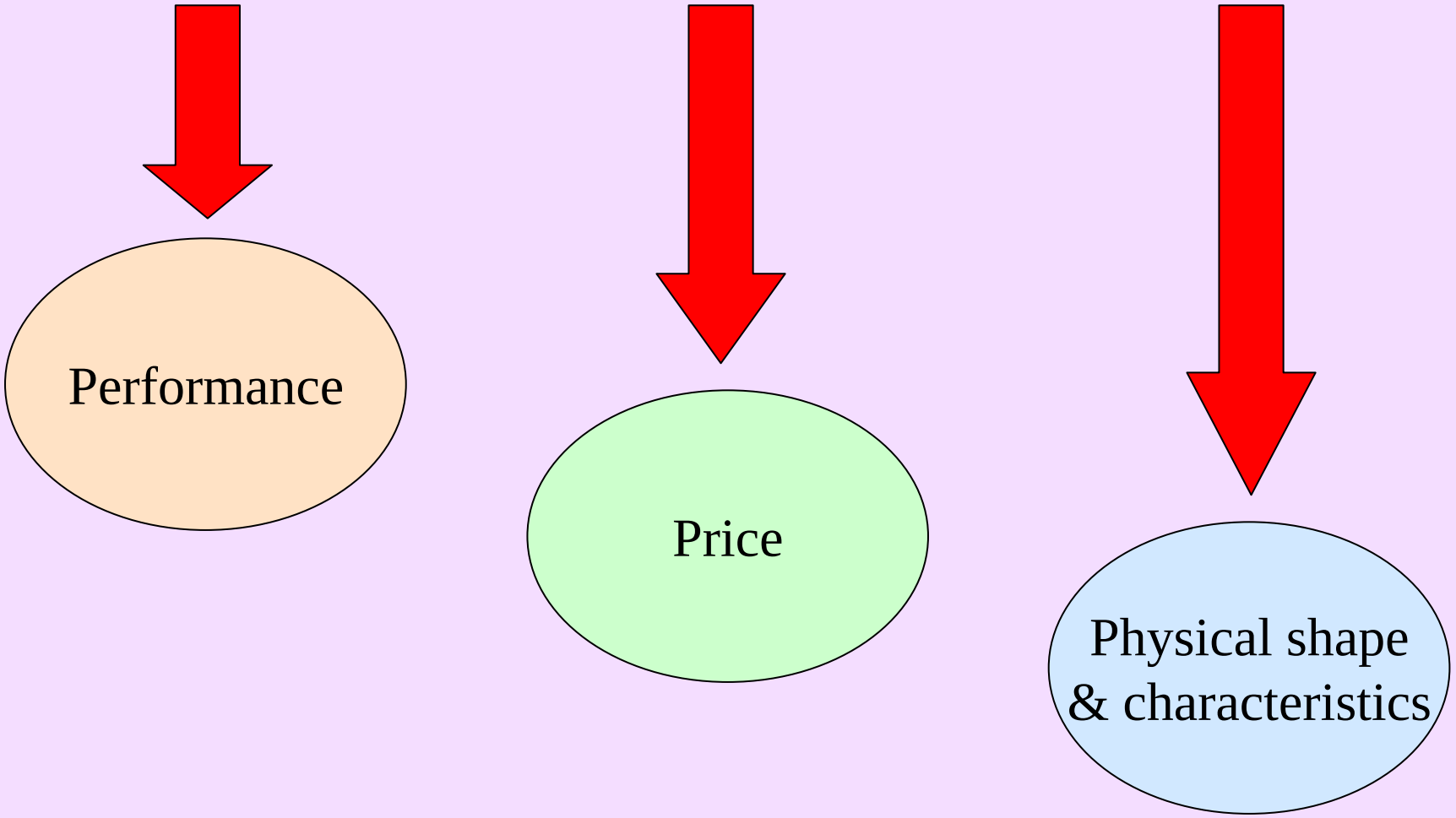


Comparative Application Characteristics of main Anionic Surfactants

DETERGENCY(*)	→	LABS	≃	MES	≃	FAS	≃	FAES	≃	AOS
FOAMING(*)	→	LABS	≃	AOS	≃	FAES	≃	FAS	≃	MES
SOLUBILITY	→	LABS	>	FAES	>	AOS	>	MES	>	FAS
SKIN COMPATIBILITY	→	MES	>	AOS	>	FAES	>	LABS	>	FAS
SENSITIVITY to H2O-HARDNESS	→	FAS	>	FAES	>	LABS	>	AOS	>	MES

(*) Very similar, using optimum chain length selection

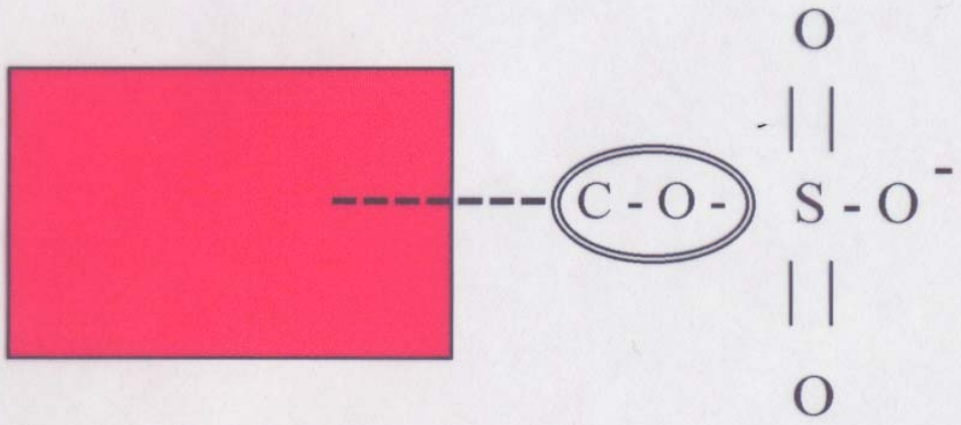
SURFACTANT SELECTION



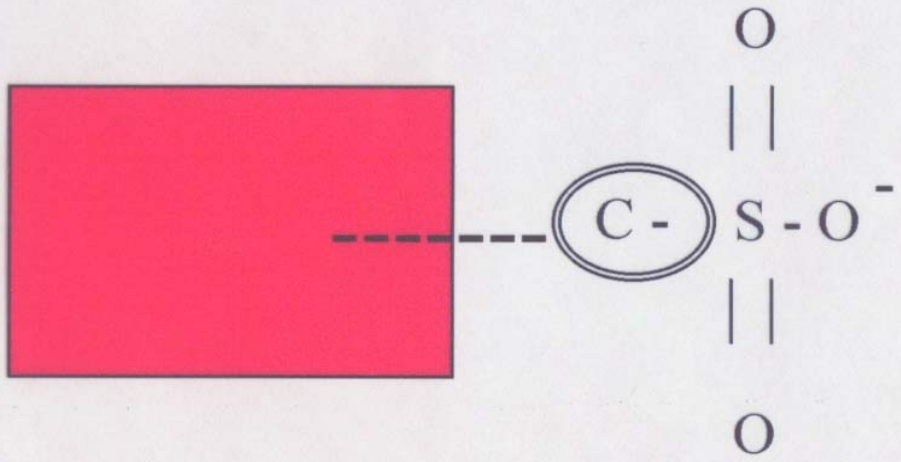
SULPHONATES

PRODUCTION TECHNOLOGY

SULPHATION REACTION



SULPHONATION REACTION



FEEDSTOCK FOR SULPHONATION PROCESS

(Key Parameters for Quality Processing)

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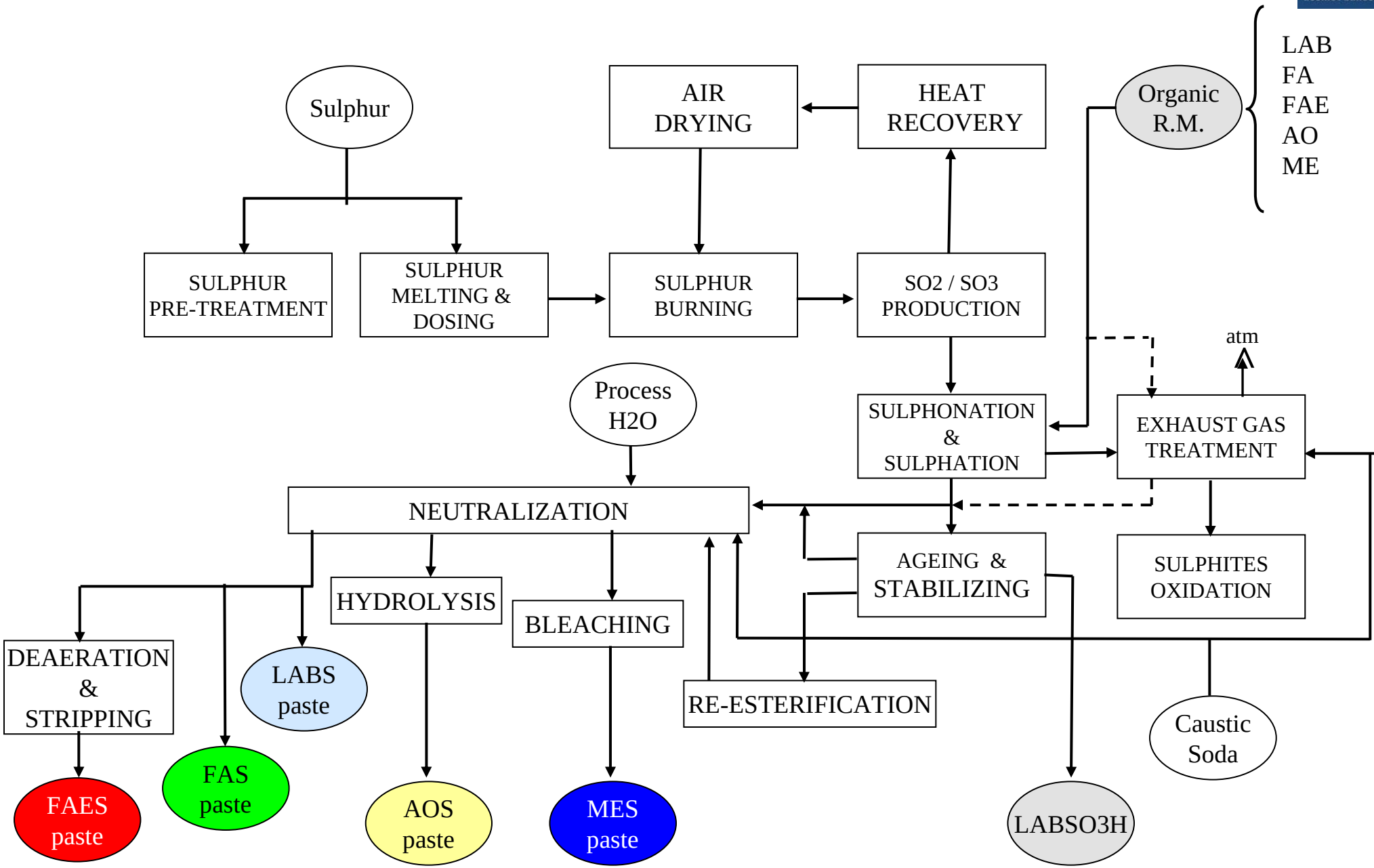
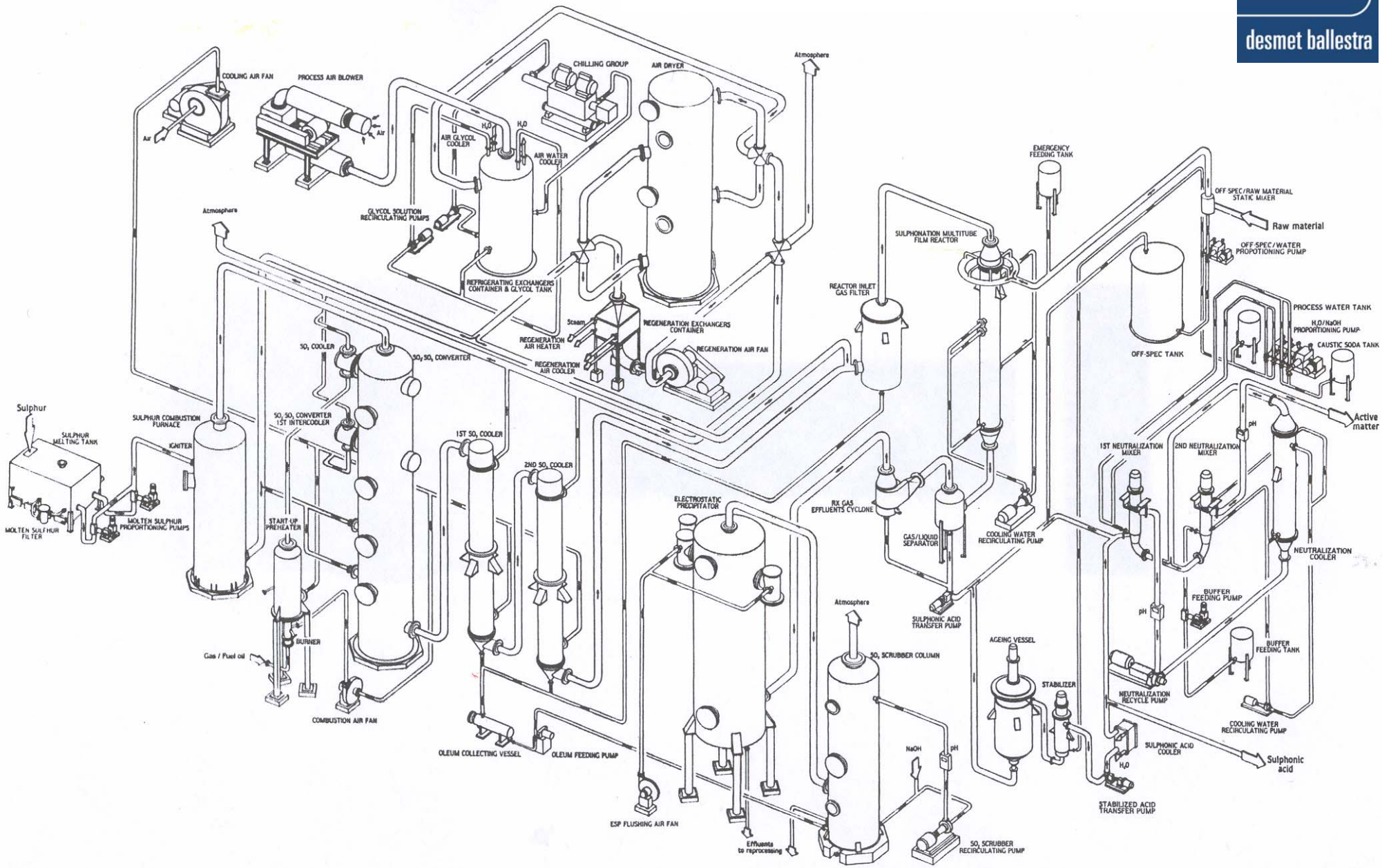
FEEDSTOCK	PARAMETER	TYPICAL FIGURES
Linear Alkylbenzene	- (High) Sulphonability - (Controlled) 2-Phenyl-Isomers Content - (Low) Moisture - (Low) Bromine Number - (Constant) Distillation Range	98.5 - 99.0 (%) 15 - 20 (%) (via HF-Alkylation) 25 - 35 (%) (via AlCl3-Alkylation) 0.01 - 0.02 (%) 0.01 - 0.02 (gr Br2/100 gr) 275 - 305 (°C)
Fatty Alcohols (Natural & Synthetic)	- (Low) Unsulphatable - (Low) Moisture - (Low) Iodine Number	0.3 - 0.5 (%) 0.01 - 0.05 (%) 0.05 - 0.10 (gr J2/100 gr)
Fatty Alcohol Ethoxylates (Natural & Synthetic)	- (Low) PEG content - (Low) Moisture content - (Negligible) EO content	0.5 (%) max. 0.01 - 0.05 (%) 2 ppm max.
Alpha-Olefins	- (Low) Moisture - (Low) Internal Olefins - (Low) Branched Olefins - (High) Alpha-Isomers Content - (Constant) Distillation Range	0.05 - 0.10 (%) 0.5 - 2.0 (%) 1.0 - 4.0 (%) 94 - 98.5 (%) (depending on cut)
Fatty Acid Methylesters	- (Low) Iodine Number - (Low) Acid Value - (Low) Moisture - (Low) Glycerides Content	0.01 - 0.3 (gr J2/100 gr) 0.1 - 0.5 (mg KOH/g) 0.05 - 0.1 (%) 0.05 - 0.1 (%)

Sulphonation Process



Sulphonation and Neutralization Plant



ANIONIC QUALITY SPECS.

PRODUCT	AM (%)	F.O. (on 100% AM)	Na_2SO_4 (on 100% AM)	°Klett Color (on 5% AM sol.)
$LABSO_3H$	97.5 - 97.7	0.8 - 1.0	0.5 - 0.6 (♦)	10 - 20
FAS (12-14 nat.)	70 - 75	0.8 - 1.0	0.8 - 1.2	5 - 10
FAS (13-15 synt.)	70 - 73	1.0 - 1.2	0.9 - 1.3	15 - 25
FAS (16-18 nat.)	68 - 70	1.5 - 1.8	1.2 - 1.7	35 - 50
AES-2EO (*)	70 - 73	0.5 - 1.0	0.6 - 1.1	3 - 10
AES-3EO (**)	70 - 73	0.8 - 1.0	0.6 - 1.0	5 - 15
AOS (14-16/14-18)	70 - 75	1.0 - 1.6	1.0 - 1.5	25 - 40
MES (12-14/16-18)	68 - 70 (***)	0.8 - 1.5	1.5 - 1.8	40 - 50 (****)

(♦) : As H_2SO_4 content
(*) : 1,4 Dioxane content of max. 30 ppm (on AM basis) with FO = 2% max. (on AM)
(**) : 1,4 Dioxane content of max. 30 ppm (on AM basis) with FO = 2,5% max. (on AM)
(***) : Di-salt content = 5% max. (on tot. AM)
(****) : Color figures after bleaching

ANIONIC SURFACTANTS PHYSICAL SPECIFICATIONS

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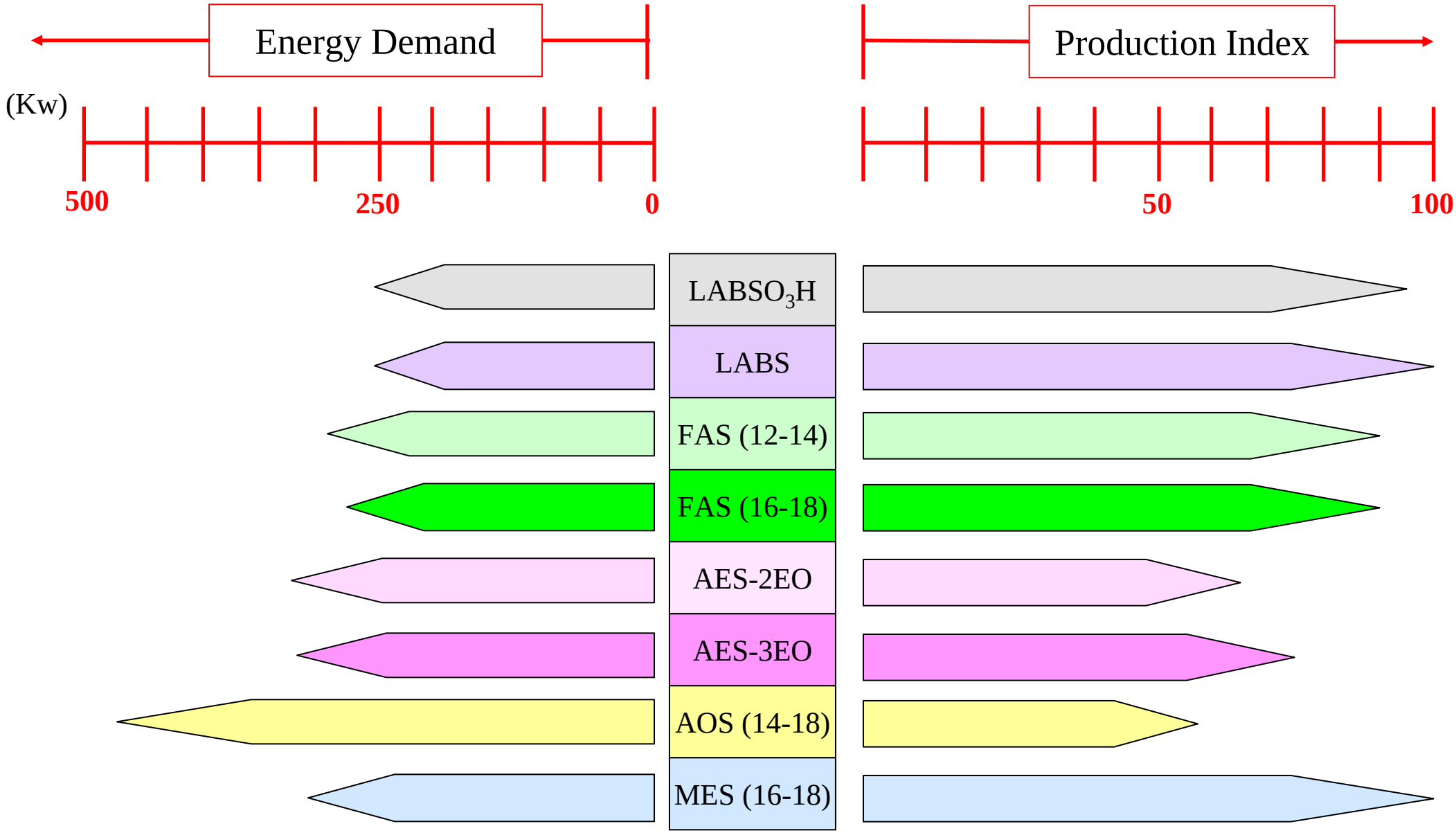
PRODUCT	SHAPE	ACTIVE CONTENT (%)	VISCOSITY (mPa.s)
LABSO3H	Liquid	≥96,5	300 - 500
LABSO3Na	Liquid	50 - 60	2000 - 5000
FAS	Liquid	27 - 30	500 - 600
	Paste	70 - 72	5000 - 10.000
FAES	Liquid	27	300 - 500
	Paste	70 - 72	5000 - 8000
AOS	Liquid	35 - 38	300 - 500
	Paste	70	7000 - 12.000
MES	Liquid	35 - 38	800 - 1500
	Paste	65 - 68	5000 - 10.000

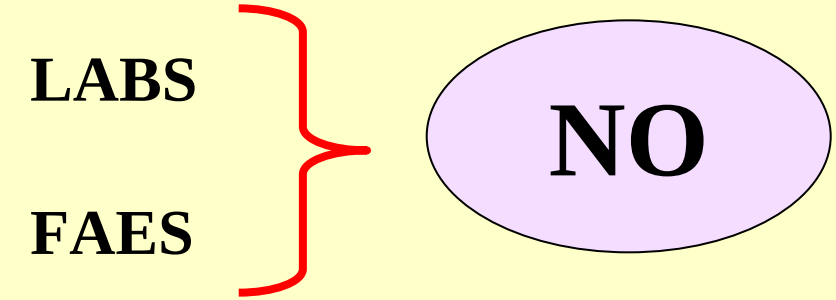
SULPHONATES PRODUCTION ENERGY DEMAND and YIELD

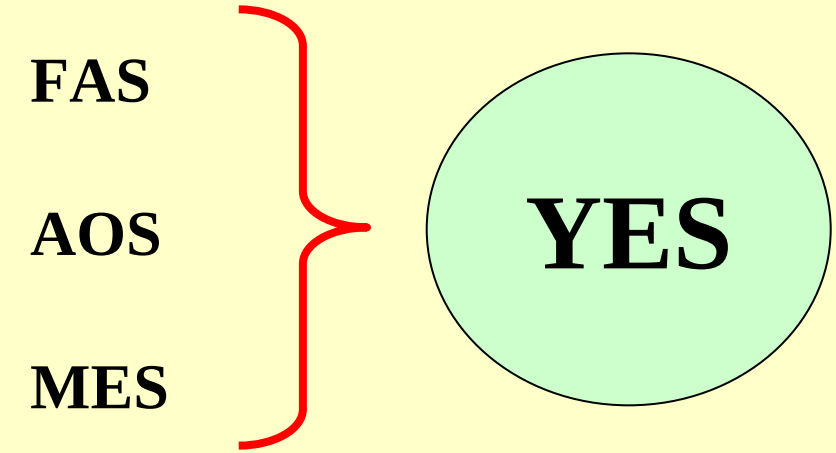


DRY-ANIONIC SURFACTANTS

PRODUCTION

SULPHONATES DRYING





SULPHONATES DRYING

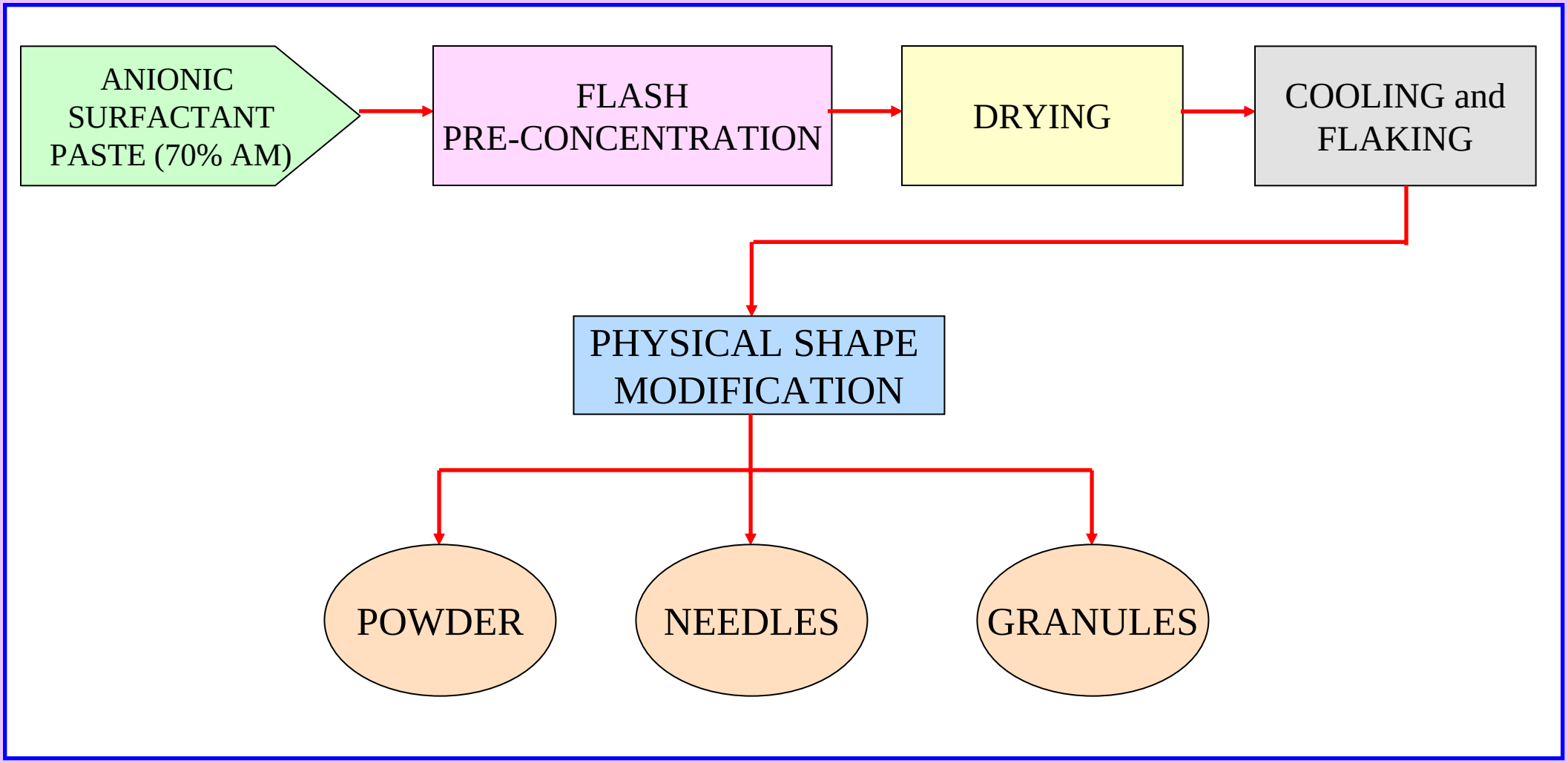
to generate products characterised by:

⇒ Optimised chemical specification (i.e.: low content of unsulphonated matter, inorganic sulphate and low color)

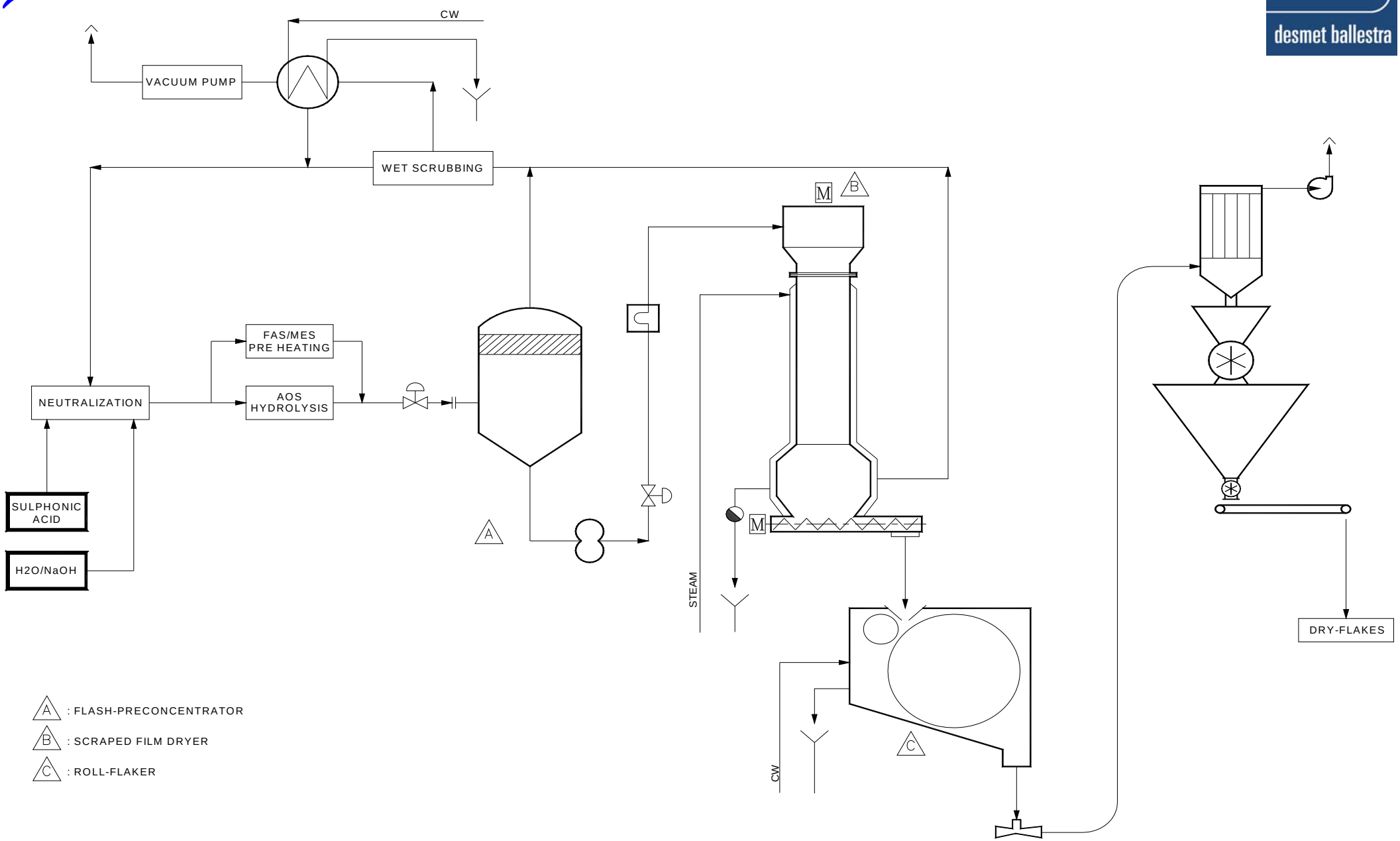
⇒ Regular and stable physical shape

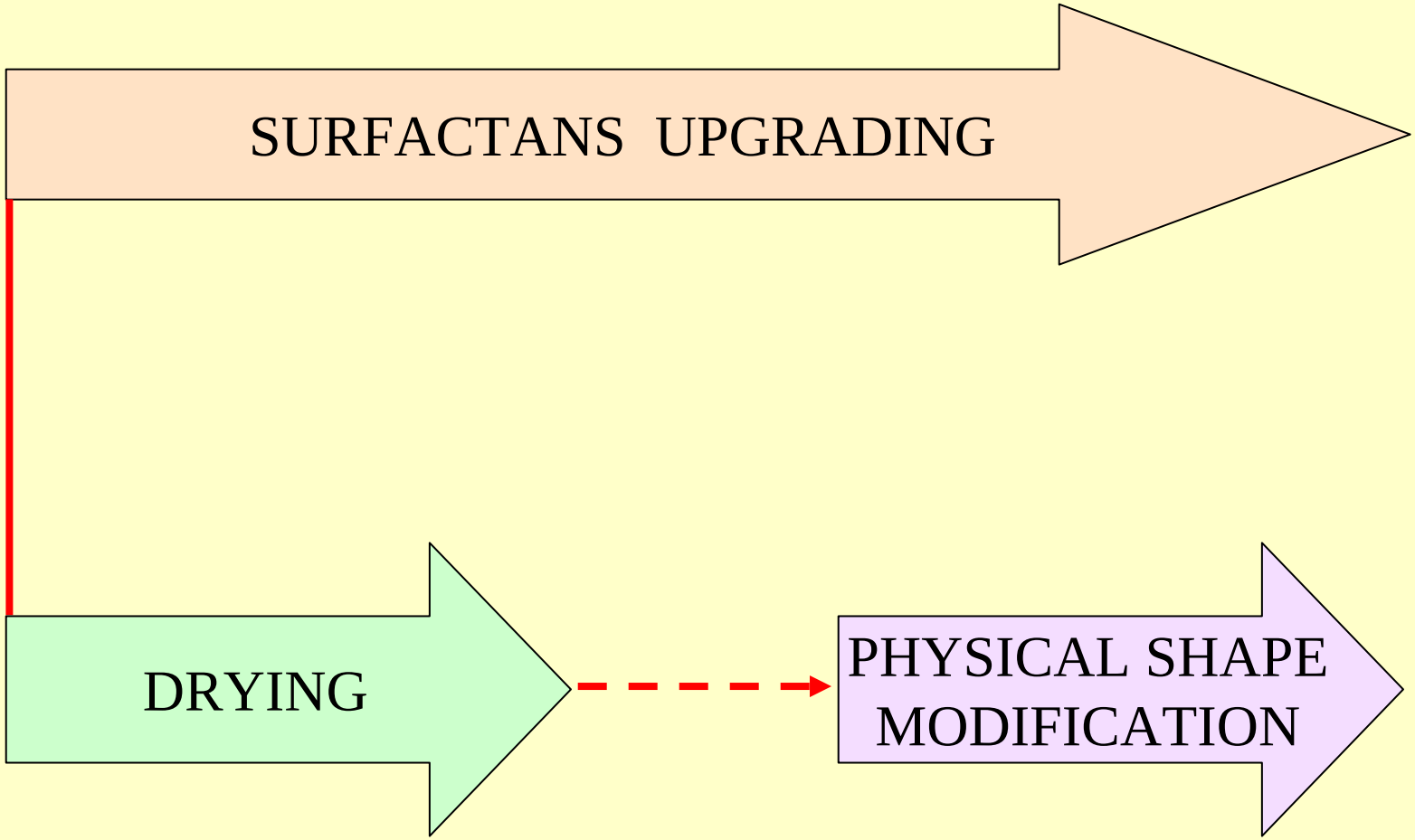
⇒ Easy handling, storage and re-using

Dry-Anionic Surfactants Production Steps

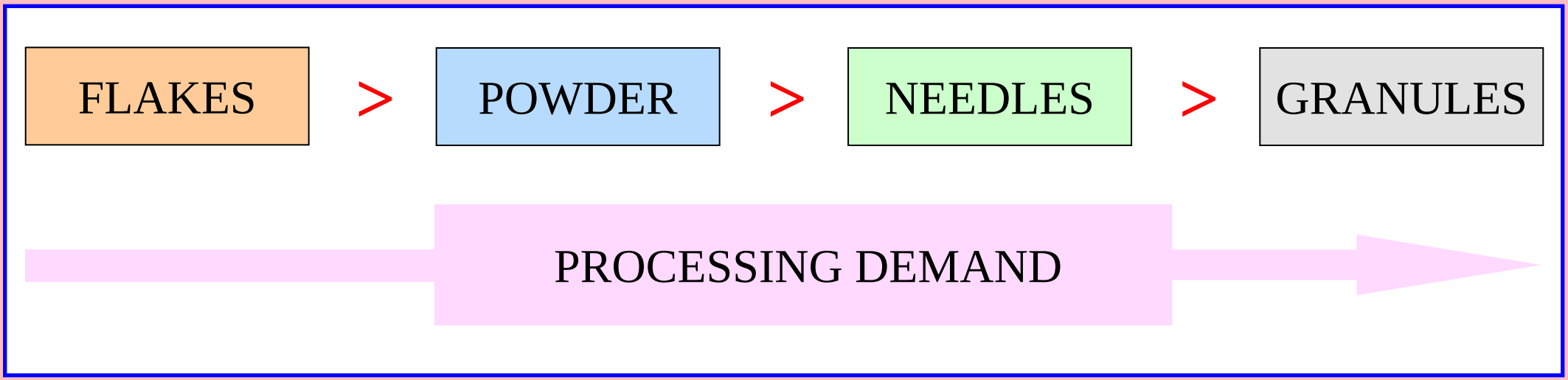


ANIONIC SURFACTANT DRYING UNIT

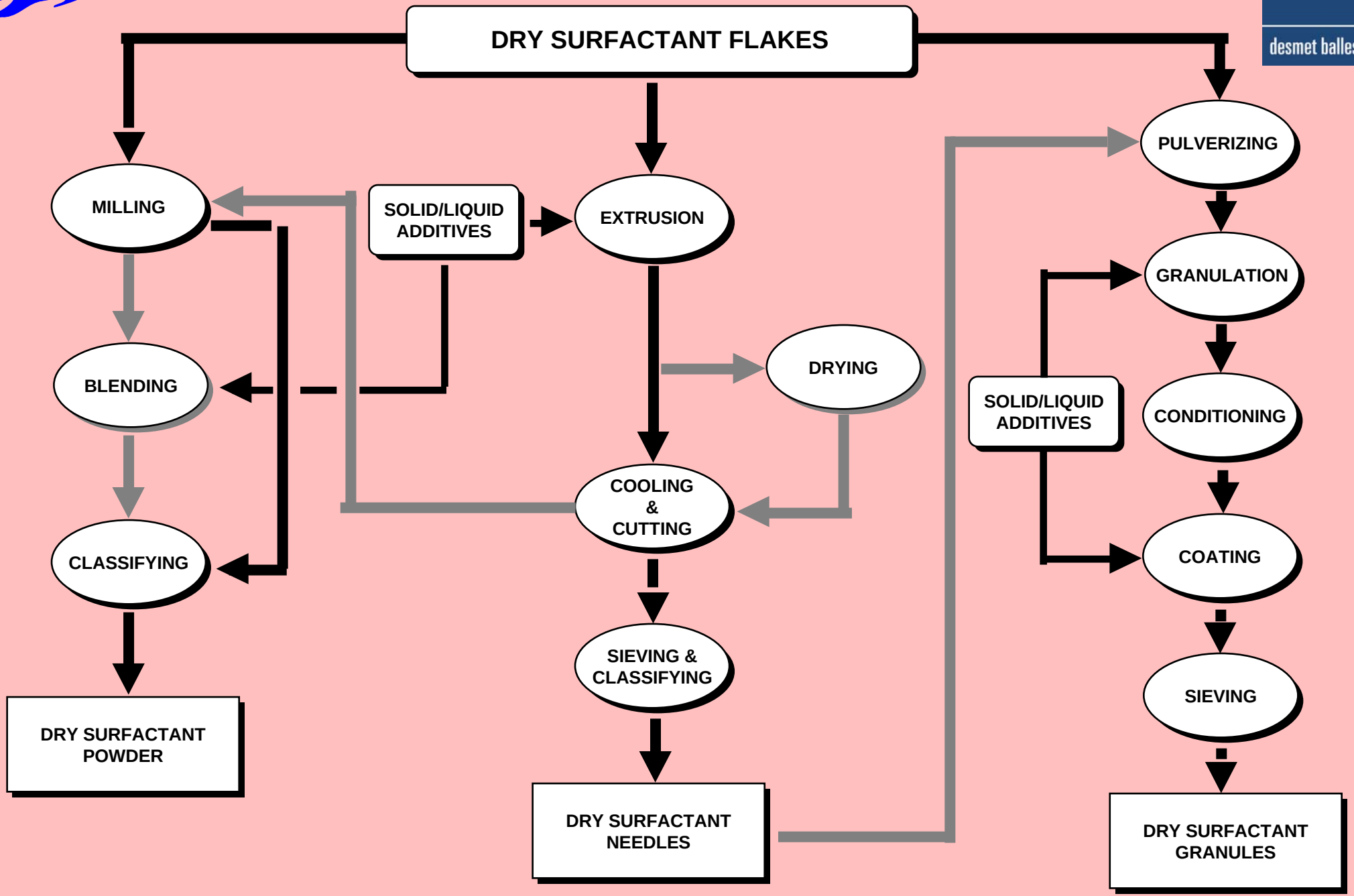



SURFACTANS UPGRADING
DRYING
PHYSICAL SHAPE MODIFICATION

Product Shape Processing Demand



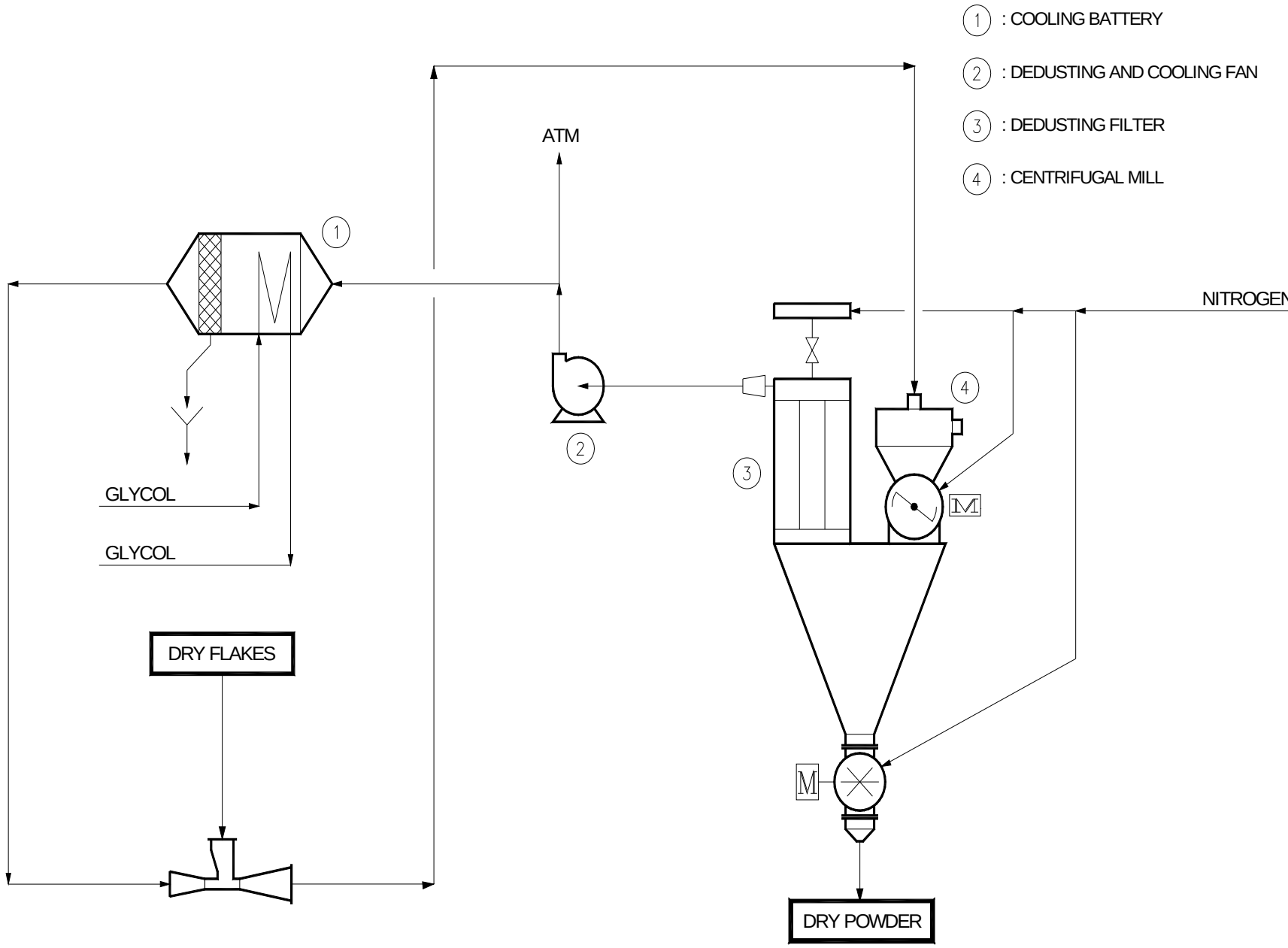
Surfactants Shape Modification Processes



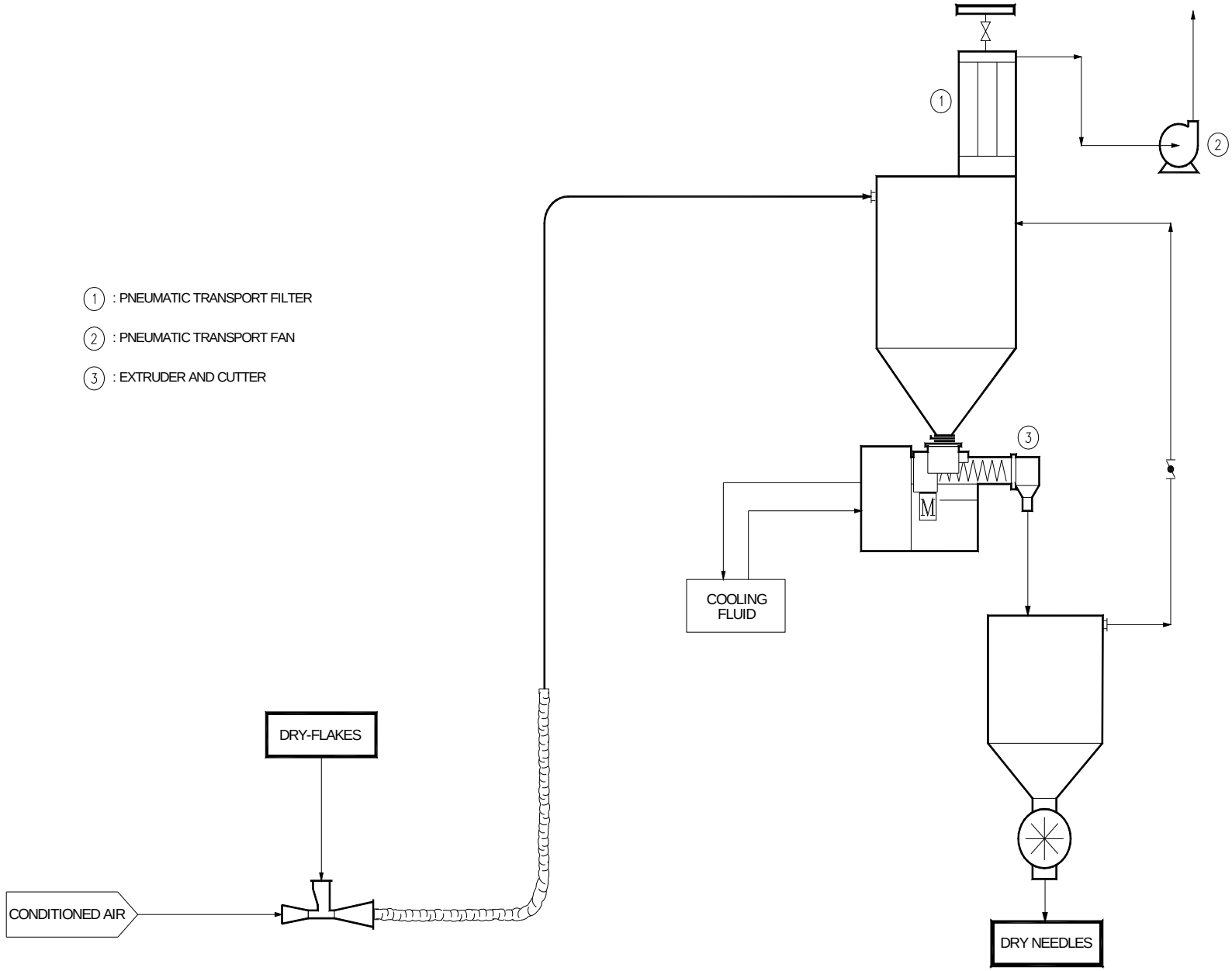
DRY SURFACTANTS PHYSICAL CHARACTERISTICS

DRY-ANIONIC SURFACTANTS		
POWDER	NEEDLES	GRANULES
BD = 500 - 550	BD = 450 - 500	BD = 450 - 700
Particle size = 100 - 1000	Diameter = 0,7 - 1,5 mm	Particle size = 500 - 1500
DFR ≥ 80	Length = 5 - 15 mm	DFR = ≥ 120

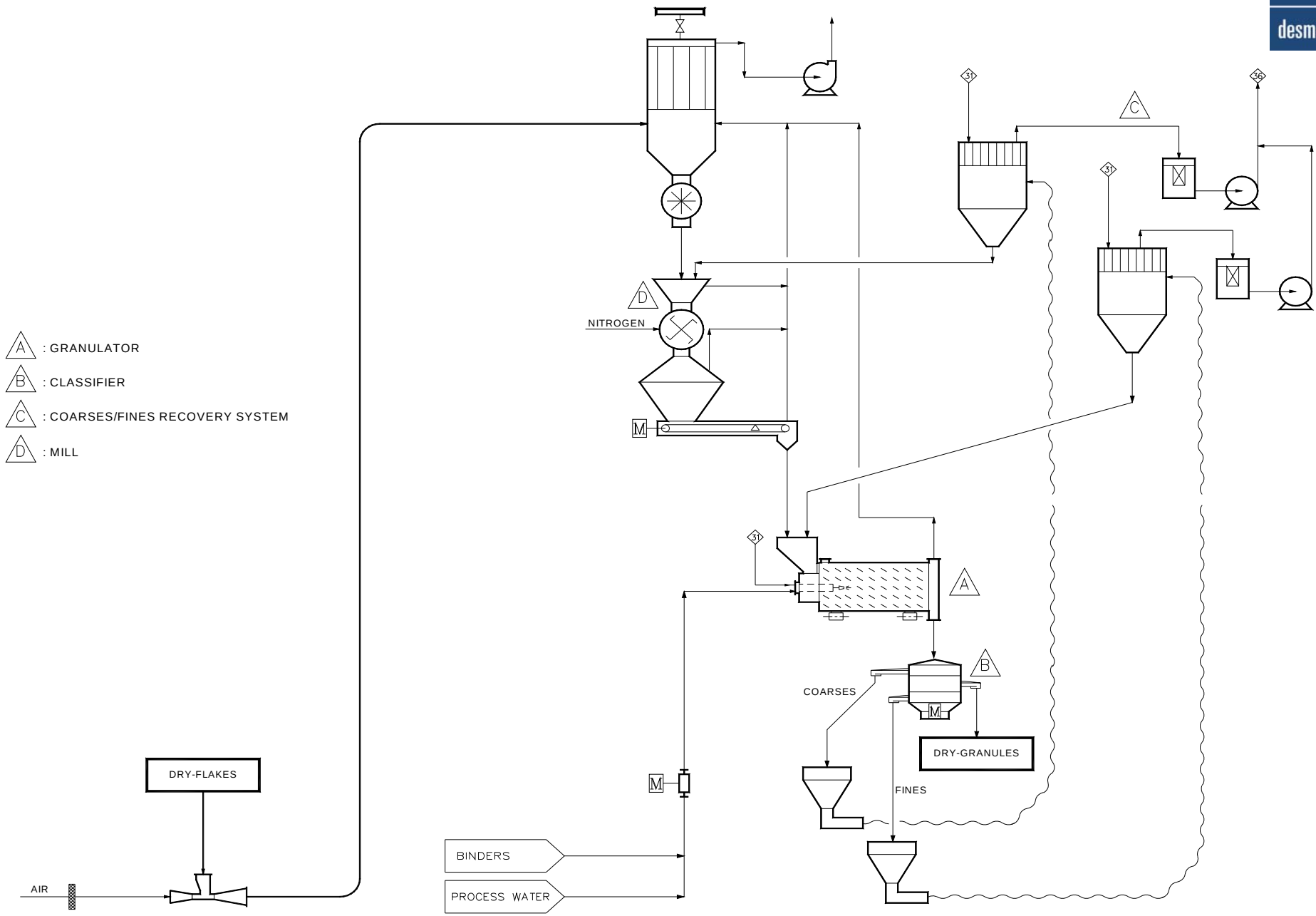
DRY-ANIONIC POWDER PRODUCTION



DRY-NEEDLES PRODUCTION



DRY-GRANULES PRODUCTION



DRY-ANIONIC SURFACTANTS

USES and ADVANTAGES

DRY-SULPHONATES **allow to produce formulated detergents by:**

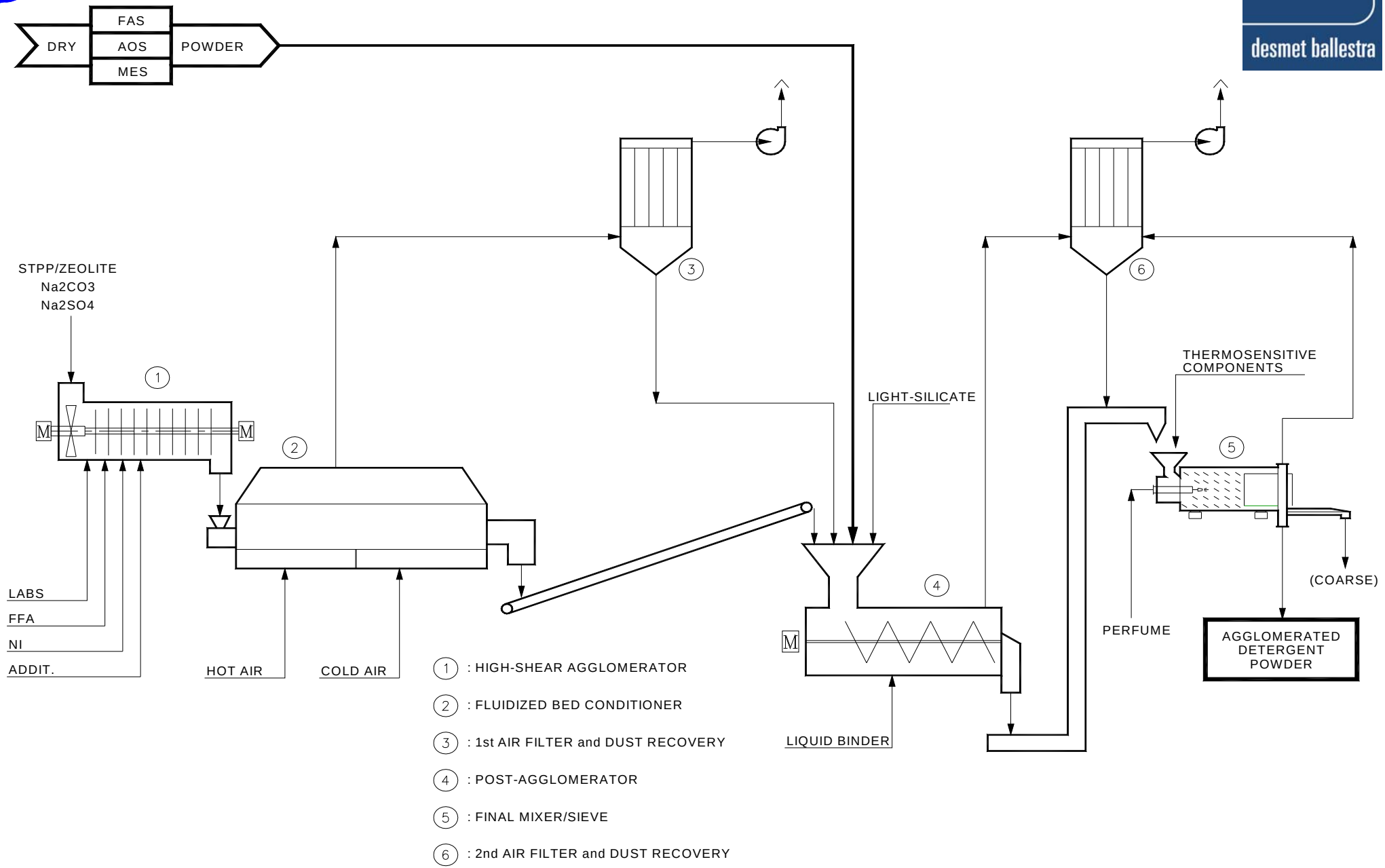
- **Simple Plant Configuration**
- **Low Energy-demanding equipment**
- **Reduced production cost**

Main applications of DRY ANIONIC SURFACTANTS

SURFACTANT TYPE	POWDERS			LIQUIDS			SYNDET BARS	
	HD	LD	DW	HD	LD	DW	HD	LD
FAS	X	XX	-	-	X	X	-	X
AOS	XX	X	-	X	X	XX	X	-
MES	XX	-	-	X	-	-	X	-

XX = Good/Suitable X = Possible Application - = Not Used/Not Suitable

NON-TOWER DETERGENT PRODUCTION PLANT



DRY-SULPHONATES in POWDER FORM

are the optimum “tool” to obtain:

- Extension of the total Active Matter content
- Improvement of the product bulk density control
- Increase of the formulation flexibility
- Reduction of the overall process energy input

SURFACTANT UPGRADING ENERGY DEMAND

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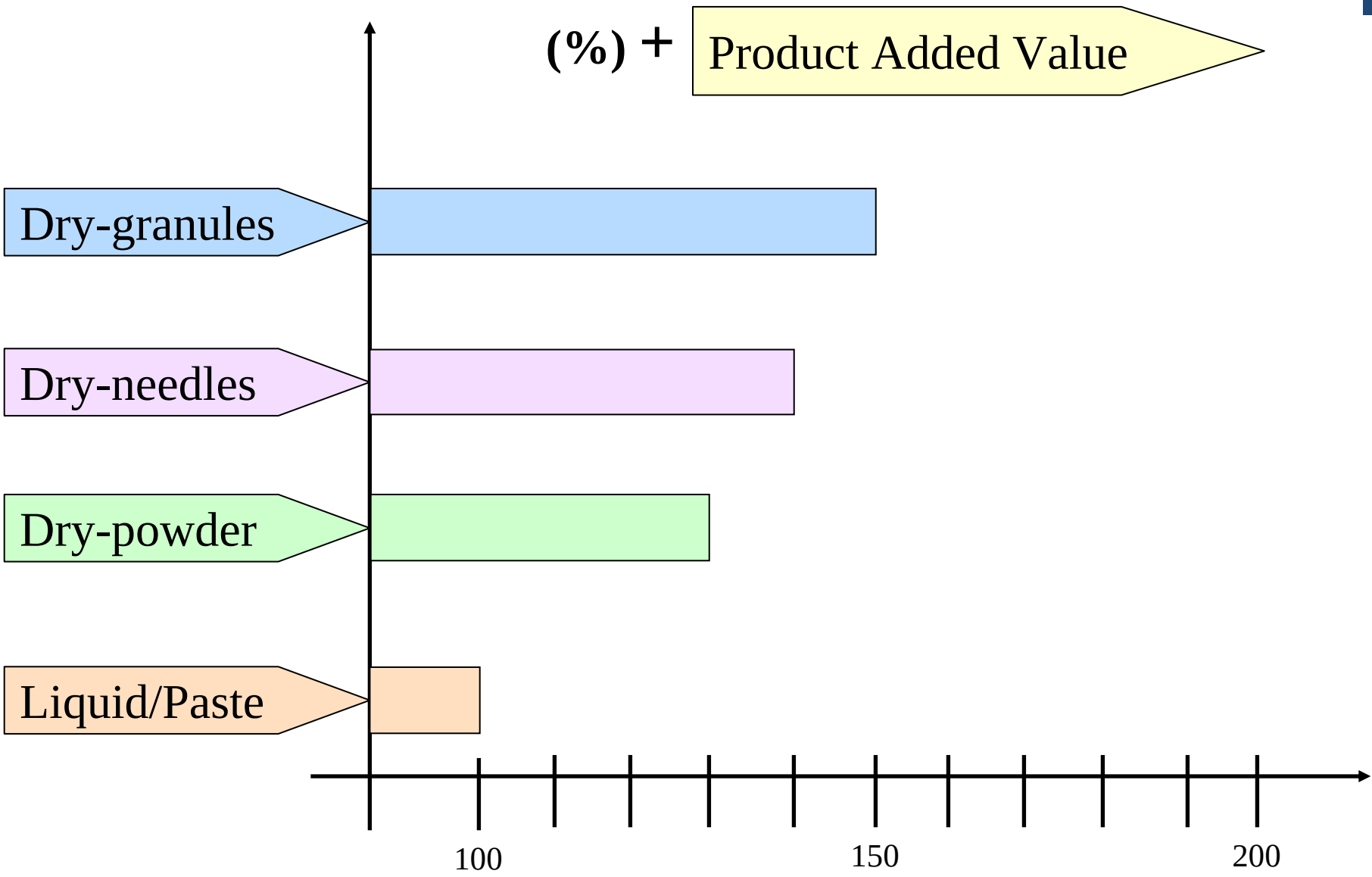
Surfactant commercial shape	FAS		AOS		MES	
	Active (%)	Additional Energy Demand (%)	Active (%)	Additional Energy Demand (%)	Active (%)	Additional Energy Demand (%)
LIQUID	30 ± 35		35 - 38		35	
PASTE	70 - 75		(70 - 75)		(65 - 70)	
DRY-FLAKES	>90	+ 38-40	>90	+ 23-25	>90	+ 34-36
DRY-POWDER	>92	+ 50-55	>94	+ 34-36	>90	+ 50-52
DRY-NEEDLES	>90	+ 65-68	-	-	-	-
DRY-GRANULES	>85	+ 70-72	-	-	-	-

DRY-FAS ADDED VALUE



DRY-ANIONIC SURFACTANTS

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- **ADVANTAGES for DETERGENT MANUFACTURERS**

  - Workable in processes where liquid Surfactant cannot be used
  - Increased range of product formulations and relevant performance
  - Easiness in handling and dosing

- **ADVANTAGES for SURFACTANT MANUFACTURERS**

  - Easy and safe production process
  - Add value to the production
  - Easy storage, handling and transportation
  - Increased production range/variety
  - Offer additional marketing opportunities

INCREASED USE OF **DRY-ANIONIC SURFACTANTS**

DISPLAY OF THE CAPABILITY OF THE

SURFACTANTS & DETERGENTS INDUSTRY

to develop

LESS ENERGY-INTENSIVE

MORE EFFICIENT

MANUFACTURING PROCESSES

OPTIMIZATION OF

DETERGENT MANUFACTURING TECHNOLOGY