Vegetable Oils for Industrial Applications

Archer Daniels Midland Company - Industrial Oils

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ADM'S Industrial Products History

1902-Daniels Linseed Company started in Minneapolis

1903-George A Archer joins John W. Daniels

1914/15-Archer Daniels Linseed Oil production expands to WI & NY

1923-ADM hires it's first industrial research chemist

1923-The Midland Linseed Company is acquired

1929-Werner G Smith Co, largest manufacturer of core oils is purchased

1940-ADM producing hundreds of Lin and Soy oil based products serving paint, leather, printing, gasoline, paper, cosmetics, pharmaceuticals, rubber, ceramics, munitions, and insecticides industries

Archer-Daniels-Midland

(Before 1962)

1954-Resin Division of U.S. Industrial Chemicals is purchased

1962-ADM logo changed to represent natural chemical molecule

ADM

1967-ADM sells Chemical group to Ashland Chemical

1969-Specialty products division formed for food and industrial products

1978-President Jimmy Carter asks ADM to produce fuel ethanol during oil embargo

Ethanol

1992-First biodiesel plant built in Leer, Germany

Envirostrip approved by the USAF for use on the B2

2001-Technology council with P&G Chemicals formed

2005-U.S. EPA presents ADM with the Presidential Green Chemistry Award

GREEN CHEMISTRY CHALLENGE

2007- Joint development agreement with Conoco Phillips for BioMass fuel research

2009-Industrial & USP Kosher glycerin refinery operational

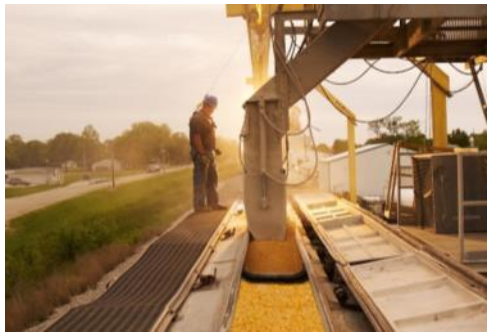
2010-Industrial & USP Kosher Propylene Glycol production starts

USP-grade propylene glycol

2012-ADM BioBased PG receives runner-up WSJ Technology Innovation Award

1900 ››››› 1910 ››››› 1920 ››››› 1930 ››››› 1940 ››››› 1950 ››››› 1960 ››››› 1970 ››››› 1980 ››››› 1990 ››››› 2000 ››››› 2010 ››››› 2020

ADM Overview



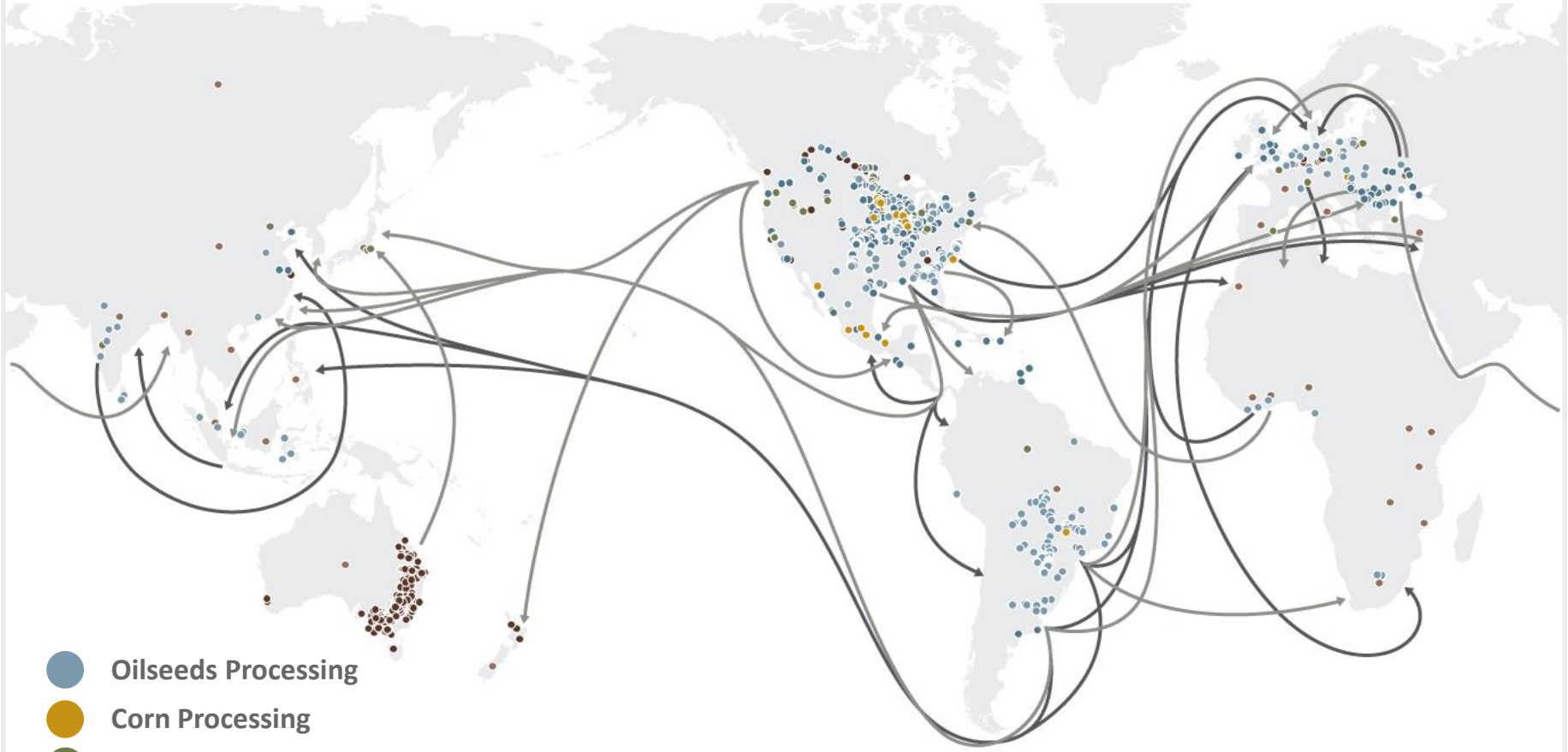
- $80+ Billion in Revenues
- Ranked No. 27 on the Fortune 500

- 33,000 Global Employees
  - 140 countries
  - 6 continents

- Ag Processor & Food Ingredient Provider
  - 470 crop procurement facilities
  - 285 ingredient processing plants
  - 40 innovation centers

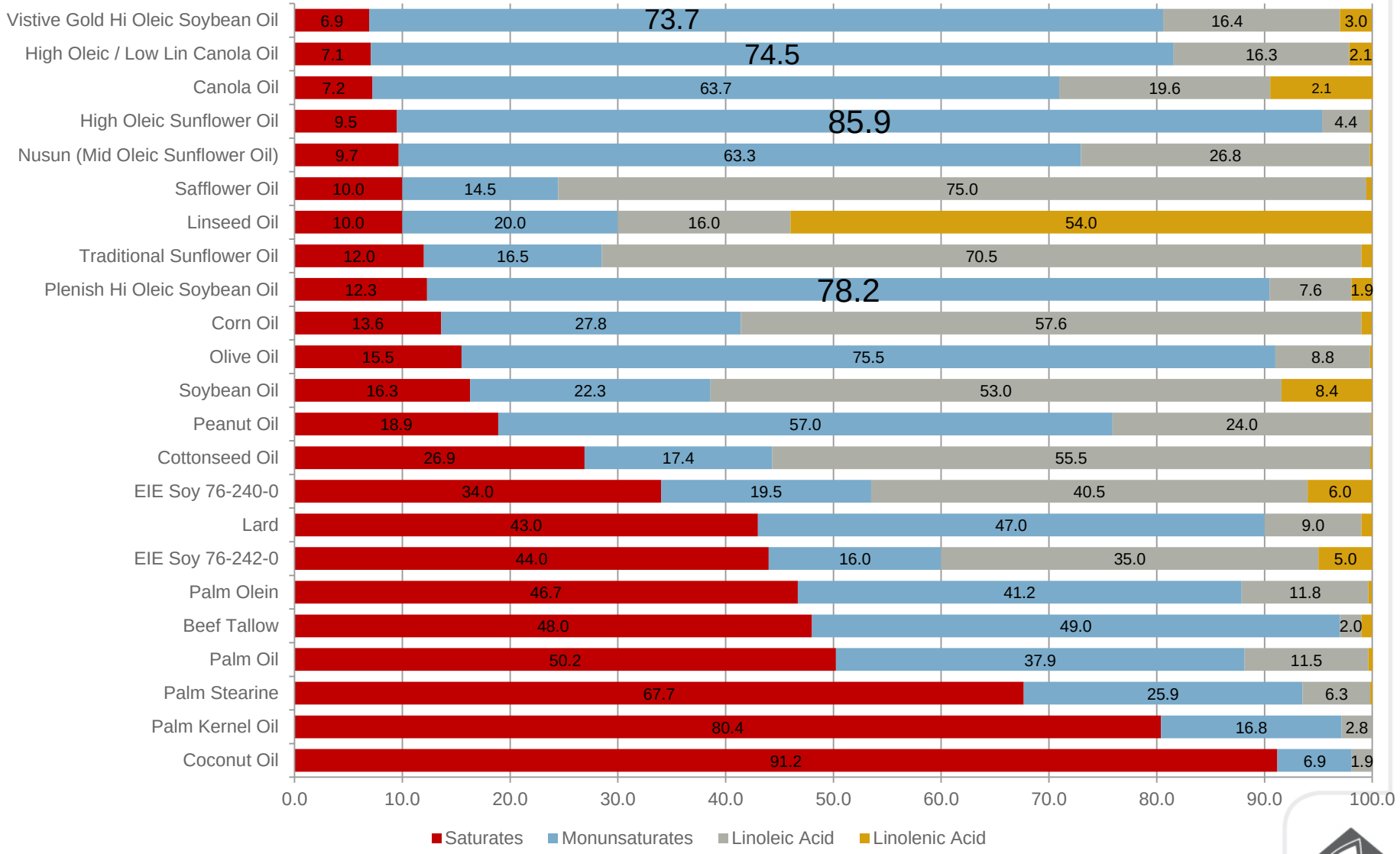
- Premier Transportation Network
  - 1,900 trucks & trailers
  - 27,400 railcar fleet
  - 2,500 barges
  - 52 deepwater vessels

World's Most Diversified Assets

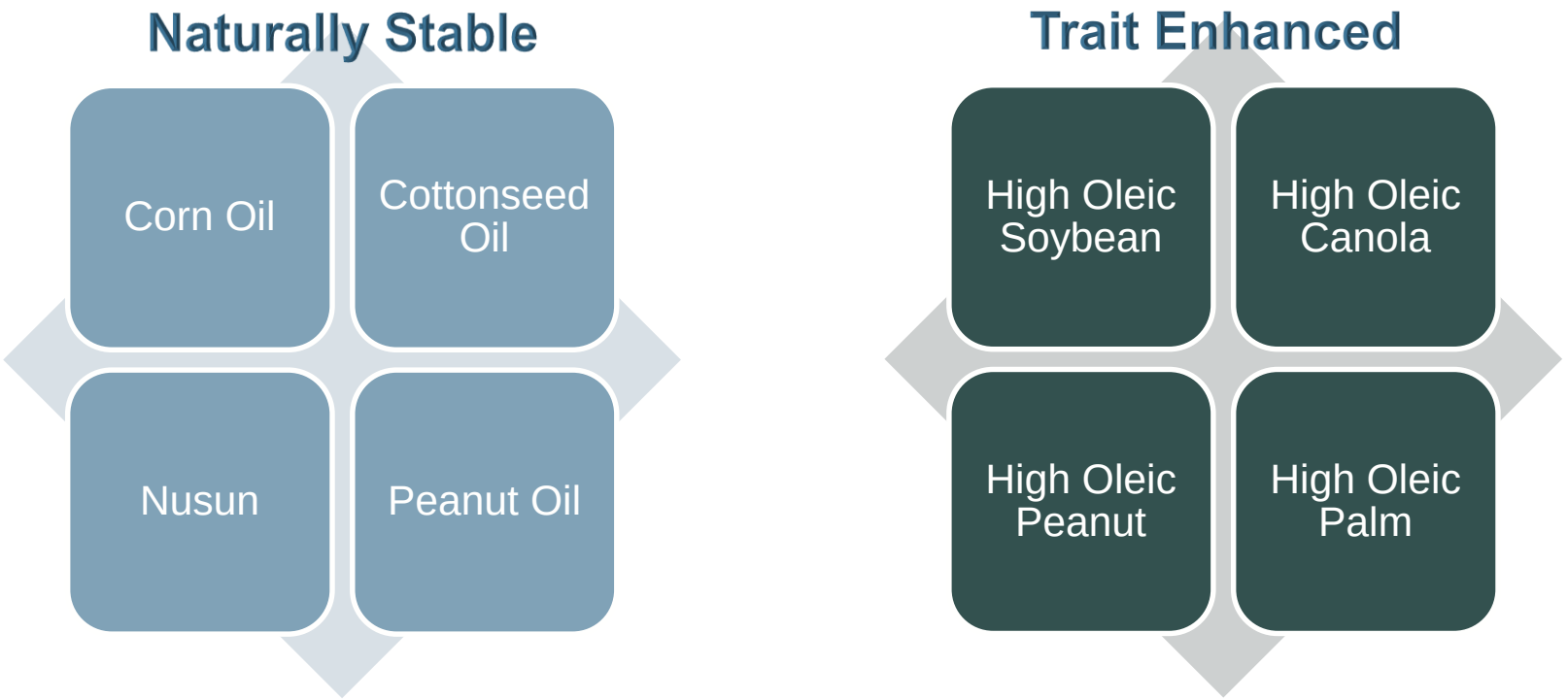


ADM

Fatty Acid Profile of Common Oils & Fats

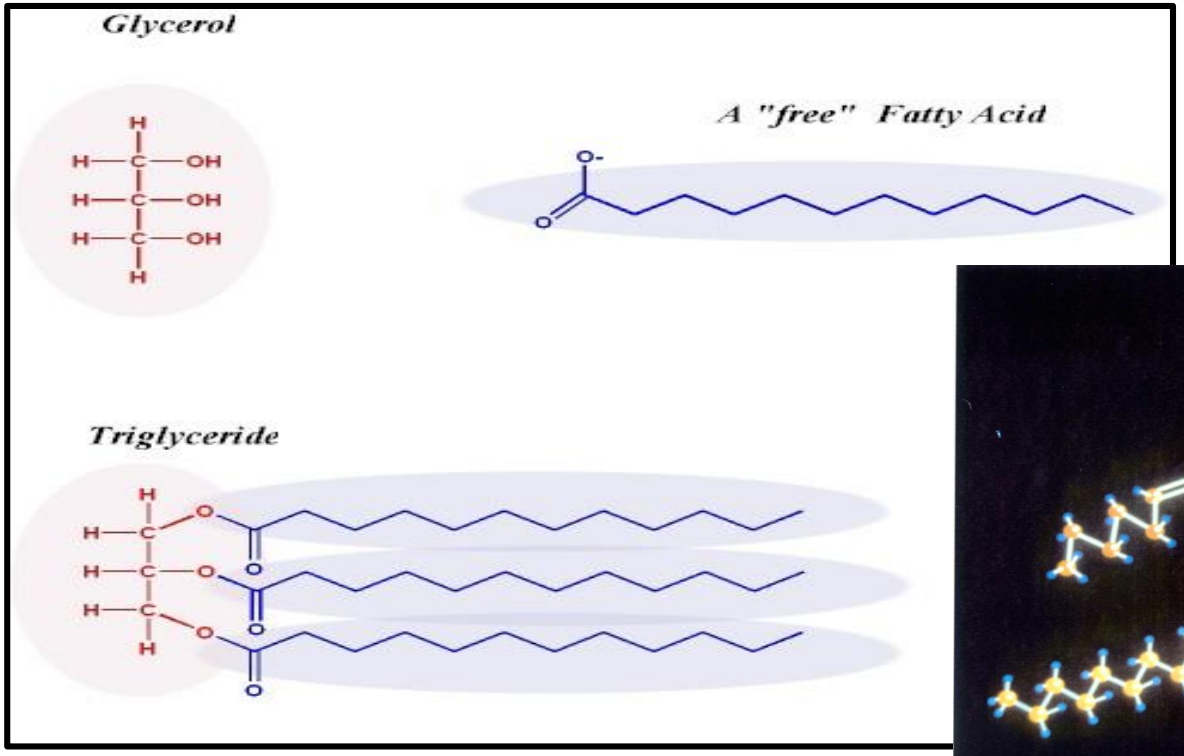


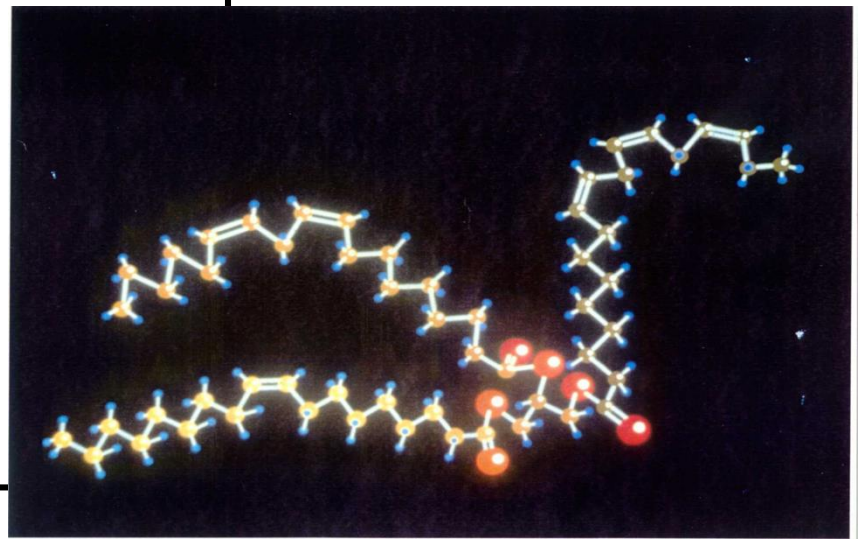
Stability – The Need for Stable Oils



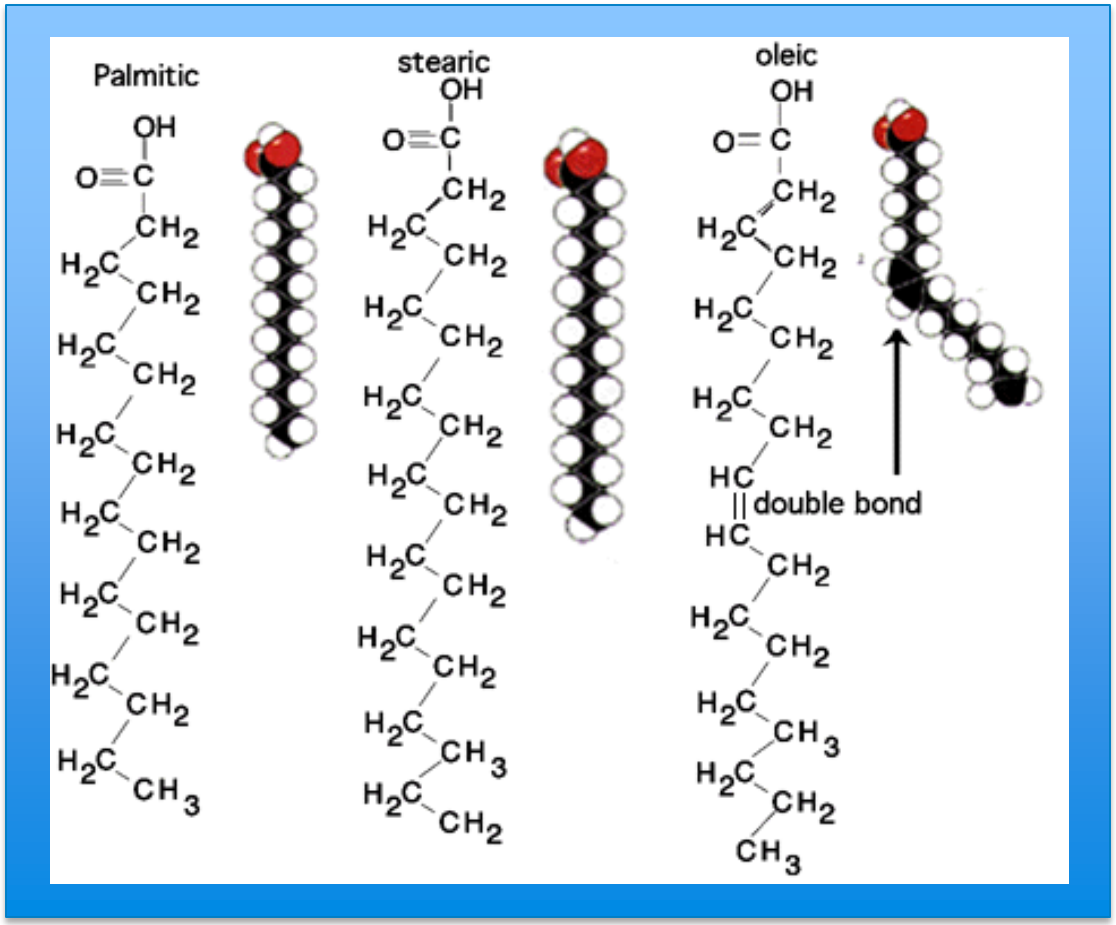
Triglycerides

- Oils and fats are made up of triglycerides.
- Triglycerides are made up of various fatty acids.
- Fatty acids can vary in chain length and degree of unsaturation.

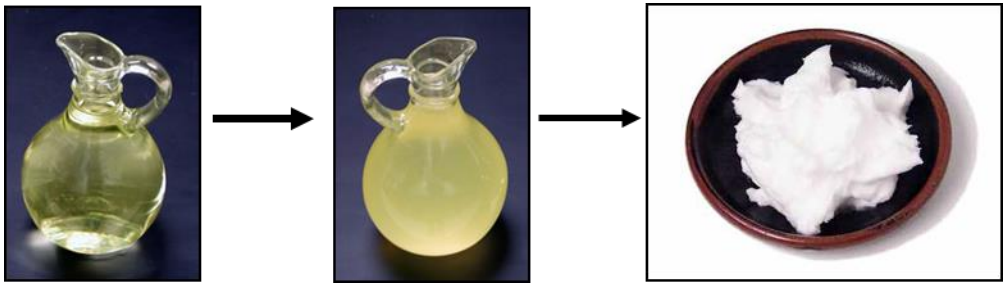




Fatty Acids



Butyric	C4:0
Caproic	C6:0
Caprylic	C8:0
Capric	C10:0
Lauric	C12:0
Myristic	C14:0
Palmitic	C16:0
Palmitoleic	C16:1
Stearic	C18:0
Oleic	C18:1
Linoleic	C18:2
Linolenic	C18:3
Arachidic	C20:0
Behenic	C22:0
Lignoceric	C24:0



Today's Presence in Industrial Markets

ADM Oils

Long/Medium **Fatty Acid Chain** *Short*

Soybean
- Commodity
- High Oleic

Canola
- Commodity
- High Oleic

Corn
Cottonseed
Sunflower
Peanut
Linseed

Palm Oil
Palm Olein
Palm Sterin

Coconut
Palm Kernel

Modification Options
Blending
Hydrogenation
Enzymatic Interesterification
Heat Bodied (LSO)
Micro-Emulsions

Evolution Chemicals

- Industrial Ethanol (USP, Industrial)
- Glycols (USP PG, PGI)
- Glycerin (USP)
- Sorbitol (USP)
- Vegetable Oils
- Lecithin Products
- Xanthan Gum
- Citric Acid
- Dispersants
- Envirostrip®
- Solvents
  - Ethyl lactate
  - FAMEs
- Starch Portfolio
- Proteins
- Biobased SAPs (BioSAP)

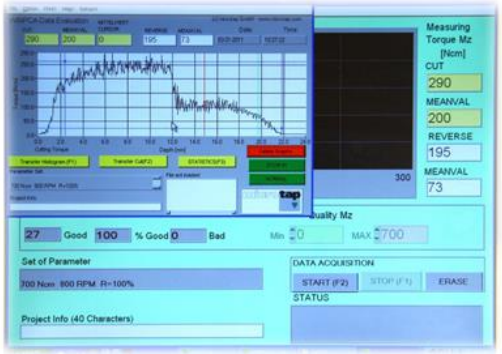
ADM

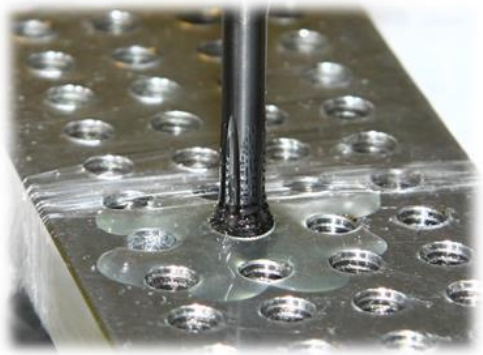
Multiple Options

- Vegetable Oils
- Polymerized Oils
- Blends

Cutting and Forming Operations

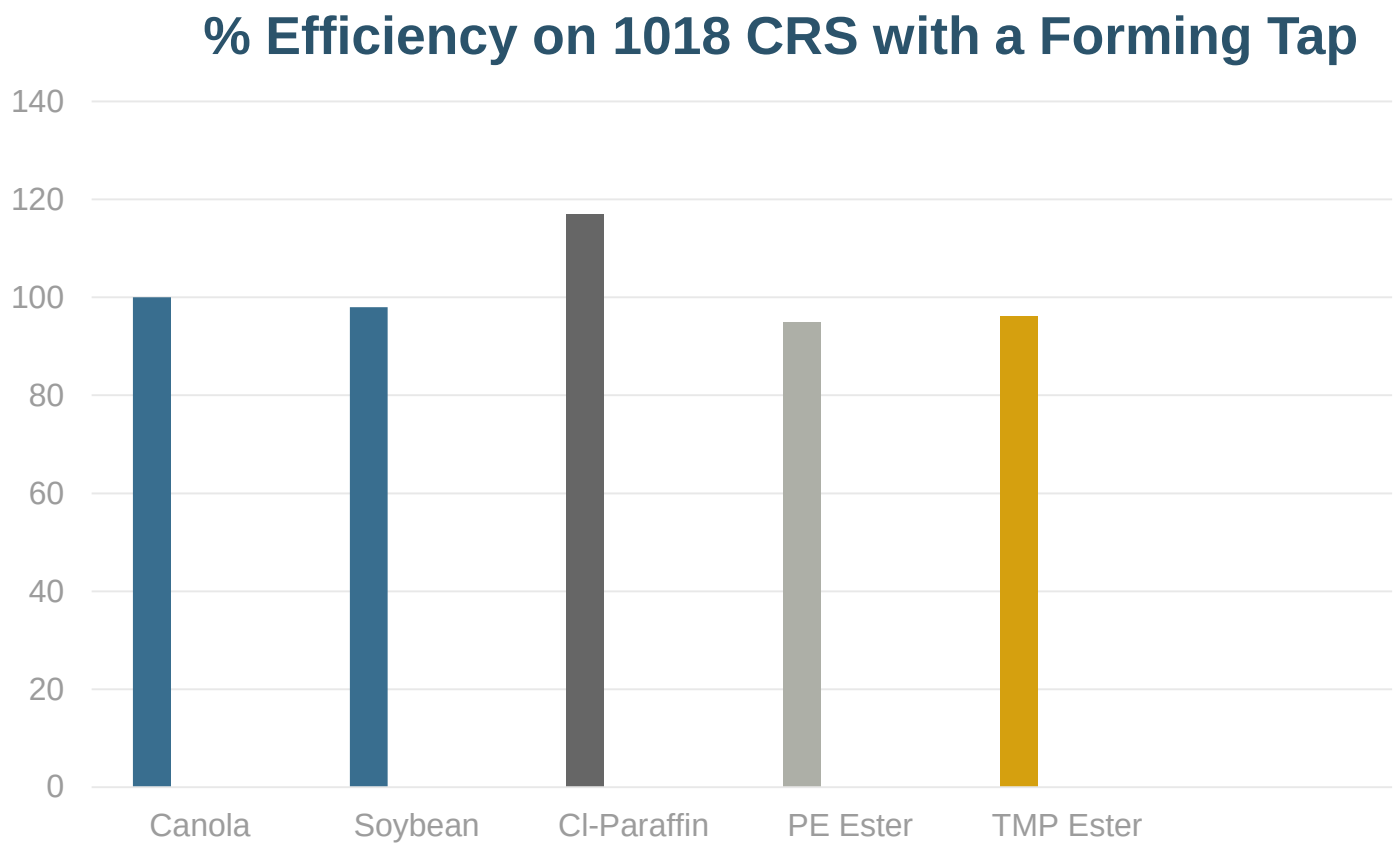
Microtap – ASTM D 5619





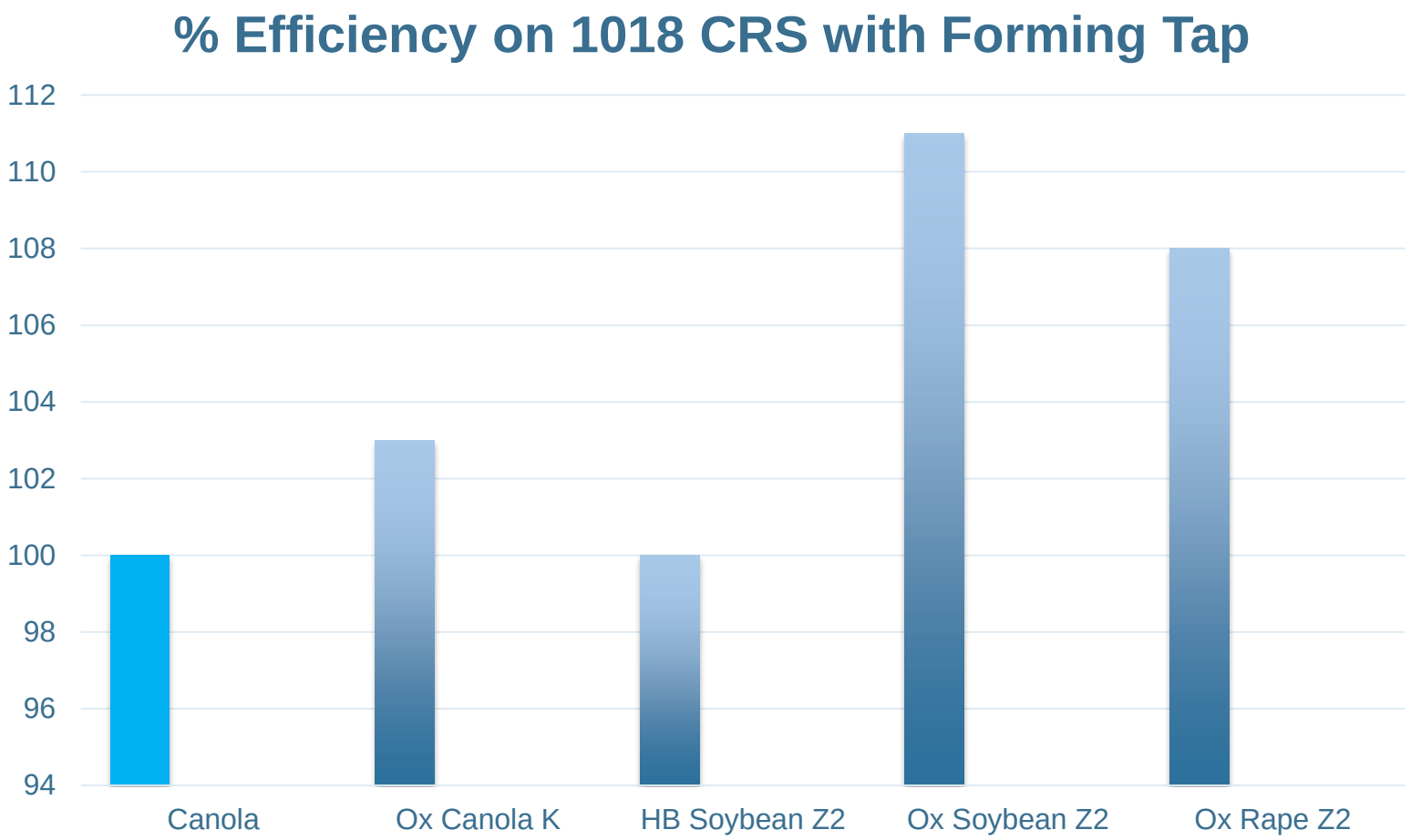
Vegetable Oils vs. Esters

Each additive is 10 parts in 90 parts 100 SUS naphthenic oil



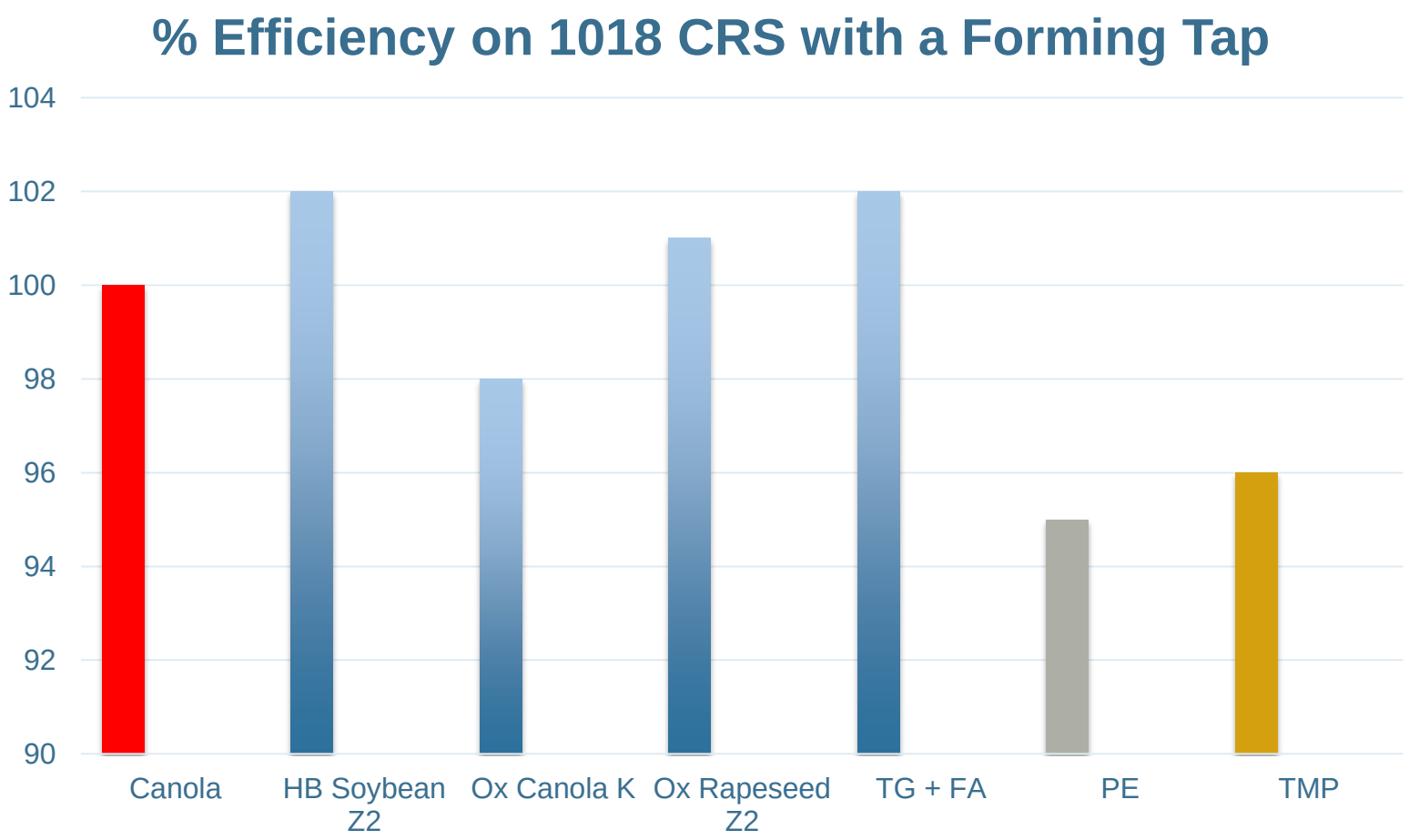
Polymerized Oils

Each additive is 10 parts in 90 parts 100 SUS naphthenic oil.



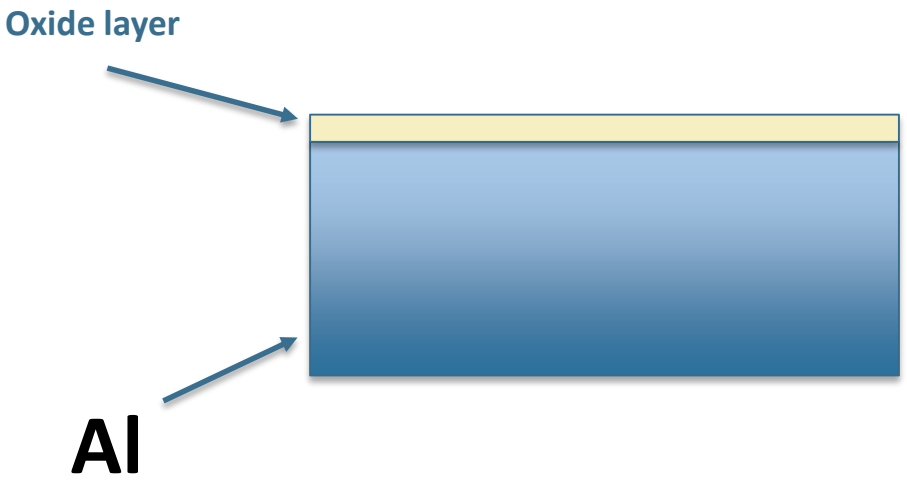
Effect of Blends

Each additive is 10 parts in 90 parts naphthenic oil



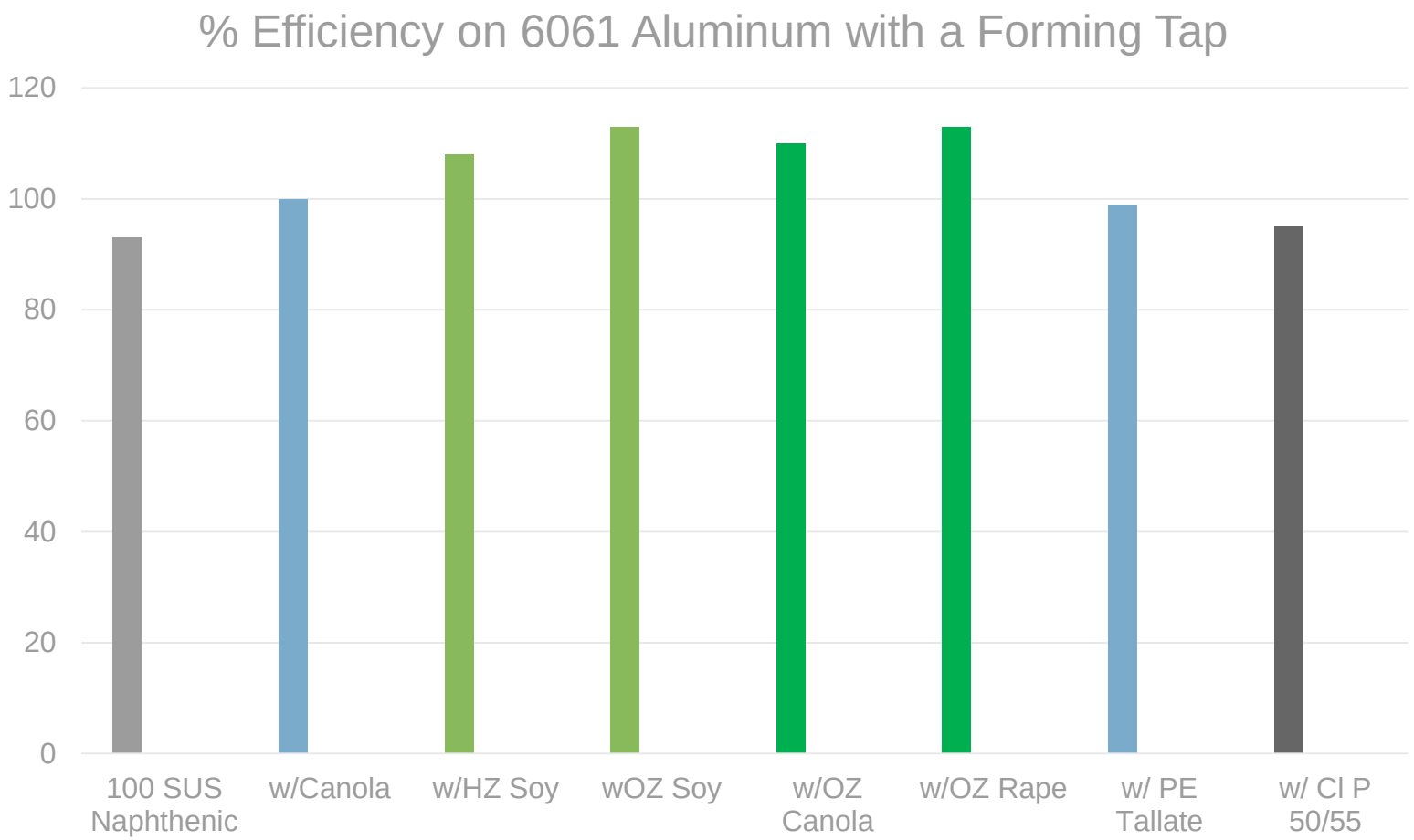
Aluminum presents an advantage

Polar additives are more effective on polar surfaces



Polymerized Oils on Aluminum

Each additive is 10 parts in 90 parts 100 SUS naphthenic oil.



SUMMARY

There are powerful alternatives to current lubricity additives

Polymers can be tailored to the application by changing molecular weight and polarity

Blends have a high potential

Polymerized oils are especially effective on aluminum

ADM Oils

Industrial Oils Solutions:

Diverse product portfolio for off the shelf items or customized products.

Technical Support:

R&D, technical sales and support for product development.

Innovation:

The ADM Industrial Oils and Evolution Chemicals specialty ingredients fosters innovation.

PRODUCT	RBD SOY OIL	RBD HIGH OLEIC SOY OIL	RBD CANOLA OIL	RBD HIGH OLEIC CANOLA OIL
DESCRIPTION	REFINED BLEACHED AND DEODORIZED SOY OIL	REFINED, BLEACHED AND DEODORIZED HIGH OLEIC SOY OIL	REFINED, BLEACHED, DEODORIZED CANOLA OIL	REFINED, BLEACHED, DEODORIZED HIGH OLEIC CANOLA OIL
TYPICAL ANALYSIS				
APPLICATIONS	OIL MUDS, ALKYD RESINS, METAL WORKING FLUIDS	OIL MUDS, LUBRICANTS, AG SPRAYS, METAL WORKING FLUIDS	OIL MUDS, LUBRICANTS, METAL WORKING FLUIDS	OIL MUDS, LUBRICANTS, AG SPRAYS, METAL WORKING FLUIDS
ACID VALUE, KOH/g (Typical)	0.075	0.087	0.078	0.064
VISCOSITY, ASTM D445 40° C (Typical)	32.3	39.3	37.5	37.7
VISCOSITY, ASTM D445 100° C (Typical)	7.6	8.5	8.2	8.4
VISCOSITY INDEX (Typical)	217	202	203	209
FLASH POINT OPEN CUP CLEVELAND (Typical)	>300°C	>300°C	>300°C	>300°C
IODINE VALUE	122-138	83	106 -120	93
SPECIFIC GRAVITY, ASTM 4052 (Typical)	0.92	0.92	0.92	0.92
OSI @ 110°c, HRS	5	15	7	16
C 18:1 (Typical_	25.0	70.0 MIN	61.5-67.0	70.0 MIN
SATURATES % (Typical)	15.0		7.0	7.0
MOISTURE %	0.05 MAX	0.05 MAX	0.05 MAX	0.05 MAX
PRODUCT FORM	LIQUID	LIQUID	LIQUID	LIQUID
PACKAGING	ISO, BULK	ISO, BULK	ISO, BULK	ISO, BULK
ISO = 20 MT ISOTAINER				

PRODUCT	ADM LINSEED OIL MICROEMULSION™	ADM BOILED LINSEED MICROEMULSION™	ADM 2X BOILED LINSEED MICROEMULSION™	ADM CME MICROEMULSION™	ADM SME MICROEMULSION™
DESCRIPTION	LINSEED OIL MICROEMULSION	BOILED LINSEED OIL MICROEMULSION	DOUBLE BOILED LINSEED OIL MICROEMULSION	CANOLA METHYL ESTERS MICROEMULSION	SOY METHYL ESTER MICROEMULSION
TYPICAL ANALYSIS					
APPEARANCE	TRANSLUCENT AMBER	TRANSLUCENT AMBER	TRANSLUCENT AMBER	TRANSLUCENT STRAW COLOR	TRANSLUCENT STRAW COLOR
APPLICATIONS	COATINGS, STAINS, COLORANTS	COATINGS, STAINS, COLORANTS	COATINGS, STAINS, COLORANTS	DEGREASER, ADHESIVE & PAINT REMOVER, LUBRICANTS METAL WORKING	DEGREASER, ADHESIVE & PAINT REMOVER, LUBRICANTS, METAL WORKING
OIL / ESTER CONTENT %	45	45	45	45	45
MICROEMULSION FORM	O/W	O/W	O/W	O/W	O/W
VISCOSITY @ 25°C	150 cps, Brookfield, 30 rpm	150 cps, Brookfield, 30 rpm	150 cps, Brookfield, 30 rpm	250 cps, Brookfield, 30 rpm	40 cps, Brookfield, 30 rpm
MOISTURE %	2.5	2.5	2.5	2.5	2.5
DENSITY LBS. / US GAL	8.30	8.20	8.80	8.30	8.10
DRIERS	N/A	COBALT / MANGANESE	COBALT / MANGANESE	N/A	N/A
SOLIDS%	82	82	82	82	82
PRODUCT FORM	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
PACKAGING	PA, DR, IBC, ISO, BULK	PA, DR, IBC, ISO, BULK	PA, DM, IBC, ISO, BULK	PA, DM, IBC, ISO, BULK	PA, DM, IBC, ISO, BULK
PA=20 KG STEEL PAIL DR = 180 KG STEEL DRUM, IBC = 1000 KG HDPE IBC, ISO = 20 MT ISOTAINER					

For more details please contact us at evolution@adm.com

PRODUCT	ADM SME™	ADM CME™	ADM HIGH STABILITY ESTER™
DESCRIPTION	SOY METHYL ESTERS CAS 68919-53-9	CANOLA METHYL ESTERS CAS 68990-52-3	MODIFIED METHYL ESTERS
TYPICAL ANALYSIS			
APPLICATIONS	LOW VOC SOLVENTS, SOAPS, CHLORINATED LUBRICANTS, CUTTING OILS, GEAR OILS, INK SOLVENTS, PLASTICIZERS, PAINT AND GRAFFITI REMOVERS		
ACID VALUE mg KOH/g	0.30	,0.40	0.50
IODINE VALUE g I^2/100 g	132	106	0
KINEMATIC VISCOSTIY 40° C	4.06 cSt	4.50 cSt	11.11 cSt
KINEMATIC VISCOSITY 100° C	1.65 cSt	1.77 cSt	2.96 cSt
VISCOSITY INDEX	255	232	121
MOISTURE	<250 ppm	<400 ppm	800 ppm
OSI (Hours)	> 6	> 9	>30
FLASH POINT	>93° C	>130° C	>190° C
SPECIFIC GRAVITY	0.88	0.88	0.96
PRODUCT FORM	Liquid	Liquid	Liquid
PACKAGING	DR, IBC, ISO, BULK	DR, IBC, ISO, BULK	DM, IBC, ISO, BULK
DM = 420 lb. STEEL DRUM,DR = 180 KG STEEL DRUM, IBC = 1000 KG HDPE IBC, ISO = 20 MT ISOTAINER, BULK			

PRODUCT	NON-BREAK	REFINED & BLEACHED	SUPERB	VARNISH
DESCRIPTION	ALKALI REFINED LINSEED OIL	FULLY ALKALI REFINED LINSEED OIL	FULLY ALKALI REFINED, BLEACHED AND DEWAXED LINSEED OIL	BREAK FREE LINSEED OIL
TYPICAL ANALYSIS				
APPLICATIONS	ALKYDS, VARNISHES VEHICLES,DRIERS	VARNISHES, ENAMELS, DRIERS, GRINDING OILS	FAST DRYING RESINGS, VARNISHES, ENAMEL VEHICLES, PRINTING INKS	RESINS, VARNISHES, ENAMELS, DRIERS, GRINDING OILS
ACID VALUE	0.5 max	0.3 max	0.3 max	2-4
COLOR, GARDNER 1953 (MAX.)	11 max	6 max	6 max	6 max
VISCOSITY (GARDNER-HOLDT)	A_1-A	A_1-A	A_1-A	A_1-A
IODINE VALUE	175-190	175-190	175-190	175-190
SAPONIFICATION VALUE	189-195	189-195	189-195	189-195
DENSITY (LBS. / US GAL)	7.71	7.71	7.71	7.71
PRODUCT FORM	Liquid	Liquid	Liquid	Liquid
PACKAGING	DR, IBC, BULK	DR, IBC, BULK	DR, IBC, BULK	DR, IBC, BULK
DR = 180 KG STEEL DRUM, ISO = 20 MT ISOTAINER				

PRODUCT	OKO S-37	OKO S-70	OKO M-2 1/2	OKO M-71/2	OKO M-17	OKO M-25	OKO M-37
DESCRIPTION	OKO™ SERIES LINSEED OIL PRODUCTS ARE HEAT POLYMERIZED OILS PRODUCED USING A SPECIAL VACUUM PROCESS. THEY POSESS LOW ACID NUMBERS AND ARE EXCEPTIONALLY LIGHT IN COLOR OKO™PRODUCTS MEET THE REQUIREMENTS OF TT-L-201						
TYPICAL ANALYSIS							
APPLICATIONS	OKO™ SERIES PRODUCTS ARE RECOMMENDED FOR PAINTS , ENAMELS, PRINTING INKS, AND MASTICS						
ACID VALUE	1-3	1-3	1-3	1-3	1-3	1-3	1-3
COLOR, GARDNER 1953 (MAX.)	6 max	6 max	6 max	6 max	6 max	6 max	6 max
VISCOSITY (GARDNER-HOLDT)	Z- : Z+	Z_2+ : Z_3-	Z_4- : Z_4+	Z_6+ : Z_7-	Z_7+ : Z_7-	Z_8- : Z_8+	Z_9- : Z_9+
IODINE VALUE	115-130	115-130	115-130	115-130	115-130	115-130	115-130
SAPONIFICATION VALUE	190-196	190-196	190-196	190-196	190-196	190-196	190-196
DENSITY (LBS. / US GAL)	7.96	7.99	8.00	8.03	8.03	8.03	8.03
PRODUCT FORM	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
PACKAGING	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK
DR = 180 KG STEEL DRUM, ISO = 20 MT ISOTAINER							

PRODUCT	ALINCO Q	ALINCO X	ALINCO Y	ALINCO Z	ALINCO Z-1	ALINCO Z-2	ALINCO Z-2/Z-3	ALINCO Z-3
DESCRIPTION	ALINCO™ LINSEED OILS ARE CLOSED KETTLE HEAT BODIED OILS OF MEDIUM ACID RANGE. ALINCO PRODUCTS MEET THE REQUIREMENTS OF TT-L-201							
TYPICAL ANALYSIS								
APPLICATIONS	ALINCO™ SERIES PRODUCTS ARE USED IN PAINTS, VARNISHES AND PRINTING INKS							
ACID VALUE	4-7	4-7	4-7	4-7	5-9	5-9	5-9	5-9
COLOR, GARDNER 1953 (MAX.)	8	8	8	8	8	8	8	8
VISCOSITY (STOKES) @ 25° C	4-5	11-15	15-20	20-25	25-32	32-41	36-46	41-55
VISCOSITY (GARDNER-HOLDT)	P-S	X+1/2	Y+1/2	Z+1/2	Z1+1/2	Z2+1/2	Z2-Z3	Z3+1/2
IODINE VALUE	130-150	120-130	120-130	120-130	120-130	115-125	115-125	115-125
SAPONIFICATION VALUE	190-196	190-196	190-196	190-196	190-196	190-196	190-196	190-196
DENSITY (LBS. / US GAL)	7.86	7.93	7.95	7.96	7.97	7.99	8.00	8.00
PRODUCT FORM	LIQUIID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
PACKAGING	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK	DR, BULK
DR = 180 KG STEEL DRUM, ISO = 20 MT ISOTAINER								

PRODUCT	ALINCO Z-4	ALINCO Z-5	ALINCO Z-6	ALINCO M25
DESCRIPTION	ALINCO™ LINSEED OILS ARE CLOSED KETTLE HEAT BODIED OILS OF MEDIUM ACID RANGE. ALINCO PRODUCTS MEET THE REQUIREMENTS OF TT-L-201			
TYPICAL ANALYSIS				
APPLICATIONS	ALINCO™ SERIES PRODUCTS ARE USED IN PAINTS, VARNISHES AND PRINTING INKS			
ACID VALUE	5-9	5-9	5-9	5-9
COLOR, GARDNER 1953 (MAX.)	8	8	8	8
VISCOSITY (STOKES) @ 25° C	55-81	81-123	123-208	570-663
VISCOSITY (GARDNER-HOLDT)	Z4+1/2	Z5+1/2	Z6+1/2-Z6+1/4	Z8-Z8+
IODINE VALUE	130-150	120-130	120-130	120-130
SAPONIFICATION VALUE	190-196	190-196	190-196	190-196
DENSITY (LBS. / US GAL)	8.01	8.03	8.05	8.05
PRODUCT FORM	Liquid	Liquid	Liquid	Liquid
PACKAGING	DR, BULK	DR, BULK	DR, BULK	DR, BULK
DR = 180 KG STEEL DRUM, ISO = 20 MT ISOTAINER				

Please Contact

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