Shell Chemicals

The Influence of Alcohol Structure on Cold-Water Cleaning Performance

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Outline

- Background
- General Procedures
- Radiotracer Detergency Results
- Reflectance Soil Removal
- Conclusions

Background

- As a general trend, the wash temperature for consumer washing has declined since the early 1990s;
- Typical wash temperatures in the 1990s were 90-100 °F, but more recently surveys have indicated the use of warm to ambient temperature wash water; and,
- Technical evaluations have been conducted to assess cleaning at 10 and 20 °C.

General Procedures

- Efforts have highlighted liquid formulations, as this has become the predominate product form in the US, and HDLs are gaining popularity in many regions;
- Most detergency studies were completed with a radiotracer soil which has been correlated to dust sebum; and,
- Limited reflectance measurements were made for confirmation.

Surfactant Sources and Acronyms

Trade Name	Chemical Description	Acronym	Supplier
NEODOL® 23	C_{12} – C_{13} – Modified OXO	Mod-OXO-23	Shell Chemical
NEODOL® 45	C_{14} – C_{15} – Modified OXO	Mod-OXO-45	Shell Chemical
NEODOL® 25	C_{12} – C_{15} – Modified OXO	Mod-OXO-25	Shell Chemical
SAFOL® 23	C12, C13 – Fischer-Tropsch	FT-OXO	Sasol (South Africa)
LIAL® 23	C_{12} – C_{13} – OXO	OXO-23	Sasol (Italy)
LIAL® 25	C_{12} – C_{15} – OXO	OXO-25	Sasol (Italy)
Acropol 35	C_{13}, C_{15} – OXO	OXO-35	ExxonMobil
STEOL®	Oleochemical	C-12,14	Stepan
Witconate™	C_{12} Linear Alkyl Benzene sulfonate	LAS	Witco

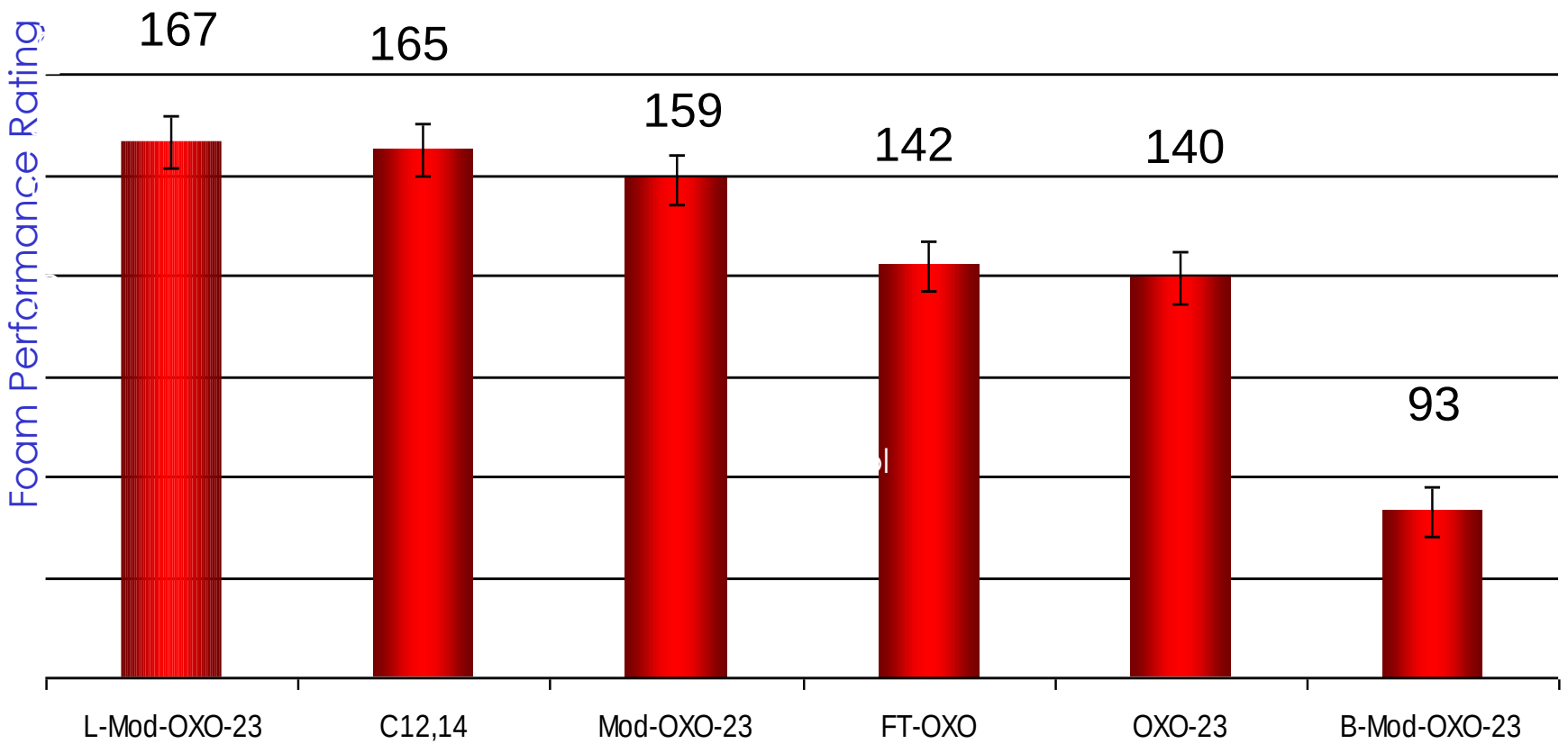
Branching pattern and types of branching in various detergent alcohols

Acronym	% Branching per Molecule	Branch Position	Branch Type
Mod-OXO-23	20	2	Methyl, Ethyl, etc.
L-Mod-OXO-23	< 1	2	Methyl, Ethyl, etc.
B-Mod-OXO-23	99	2	Methyl, Ethyl, Propyl, Butyl
Mod-OXO-25	20	2	Methyl, Ethyl, etc.
Mod-OXO-45	20	2	Methyl, Ethyl, etc.
L-Mod-OXO-45	< 1	2	Methyl, Ethyl, etc.
B-Mod-OXO-45	99	2	Methyl, Ethyl, Propyl, Butyl, Pentyl
FT-OXO	50	random	Methyl, Ethyl, Cyclohexyl
OXO-23	50	2	Methyl, Ethyl, etc.
OXO-25	50	2	Methyl, Ethyl, etc.
OXO-35	35	2	Methyl
C12,14	< 1	random	Methyl

Dishwashing Performance Comparison

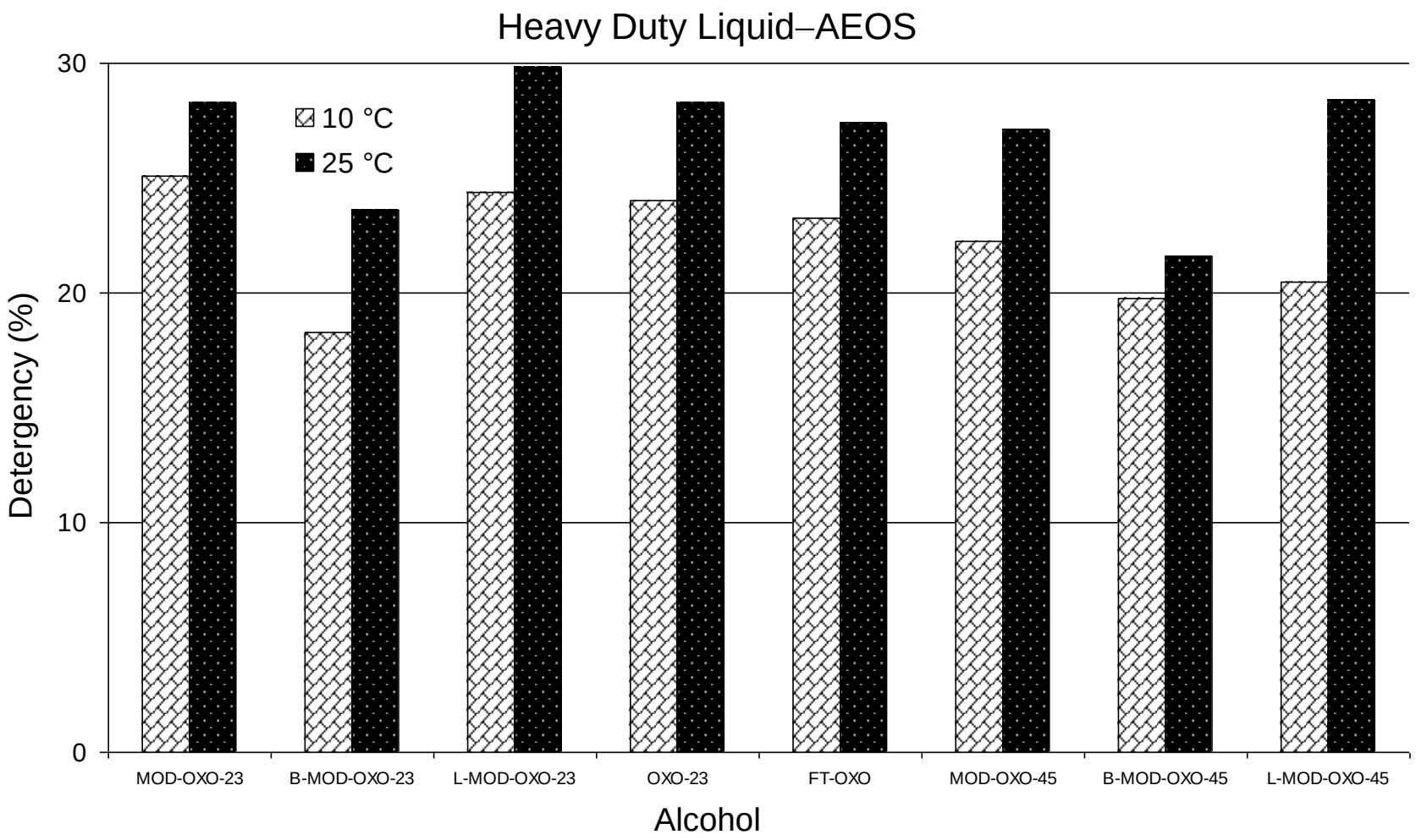
AS,AES-2,AO = 1,1.5,0.8

T = 40 °C
Active = 72 ppm
LSD_{95} = 5

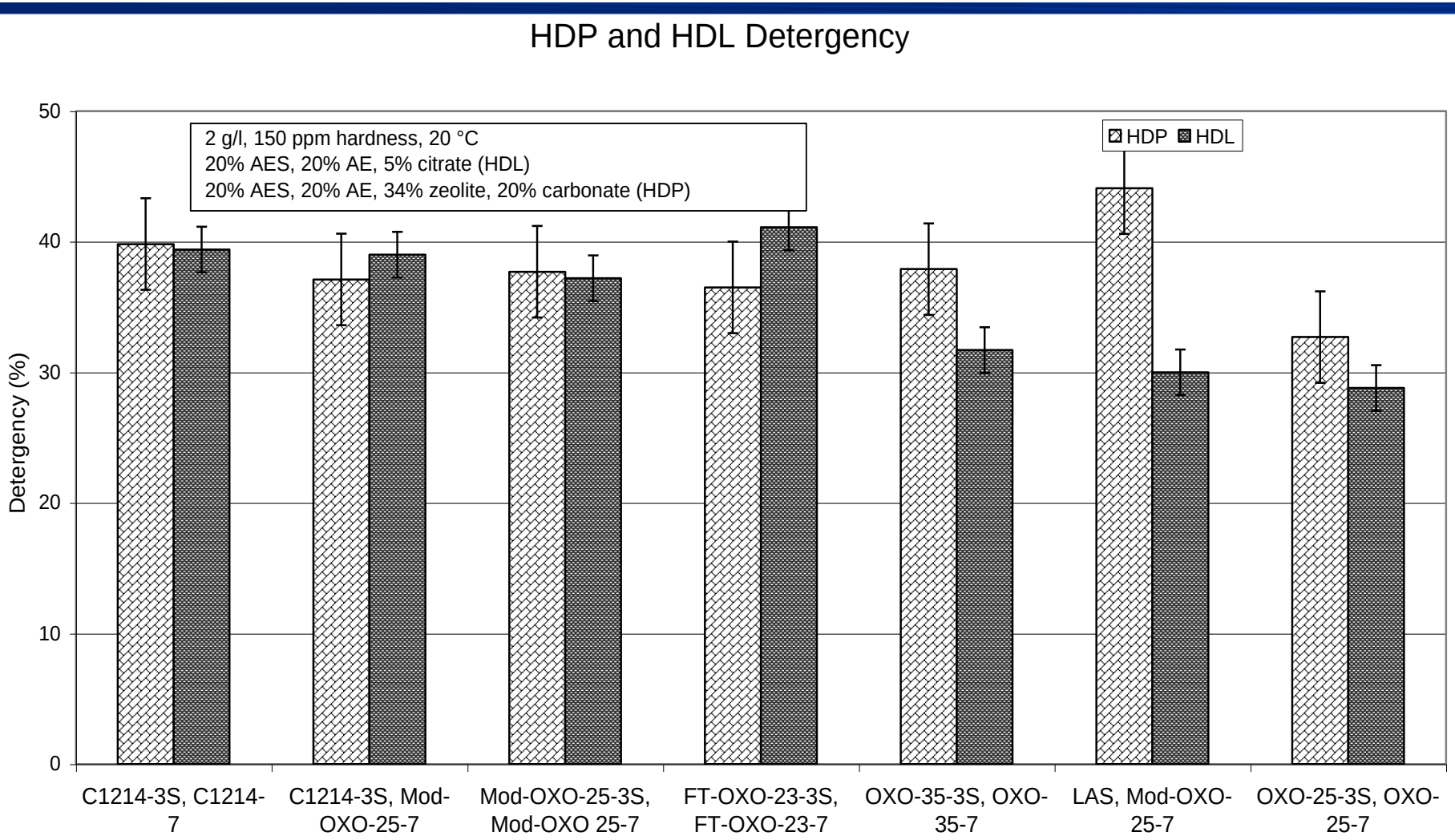


Prototype Laundry Liquids

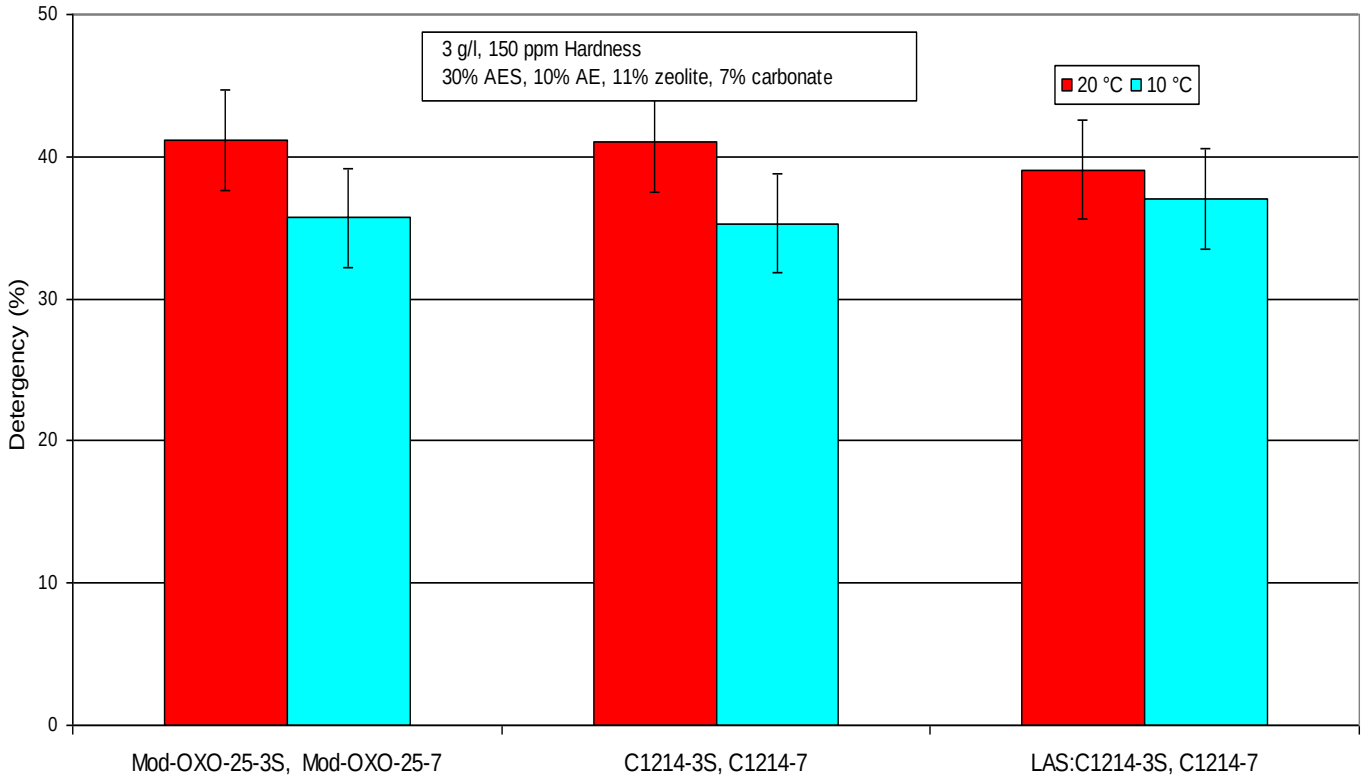
AEOS:AEO = 2:1



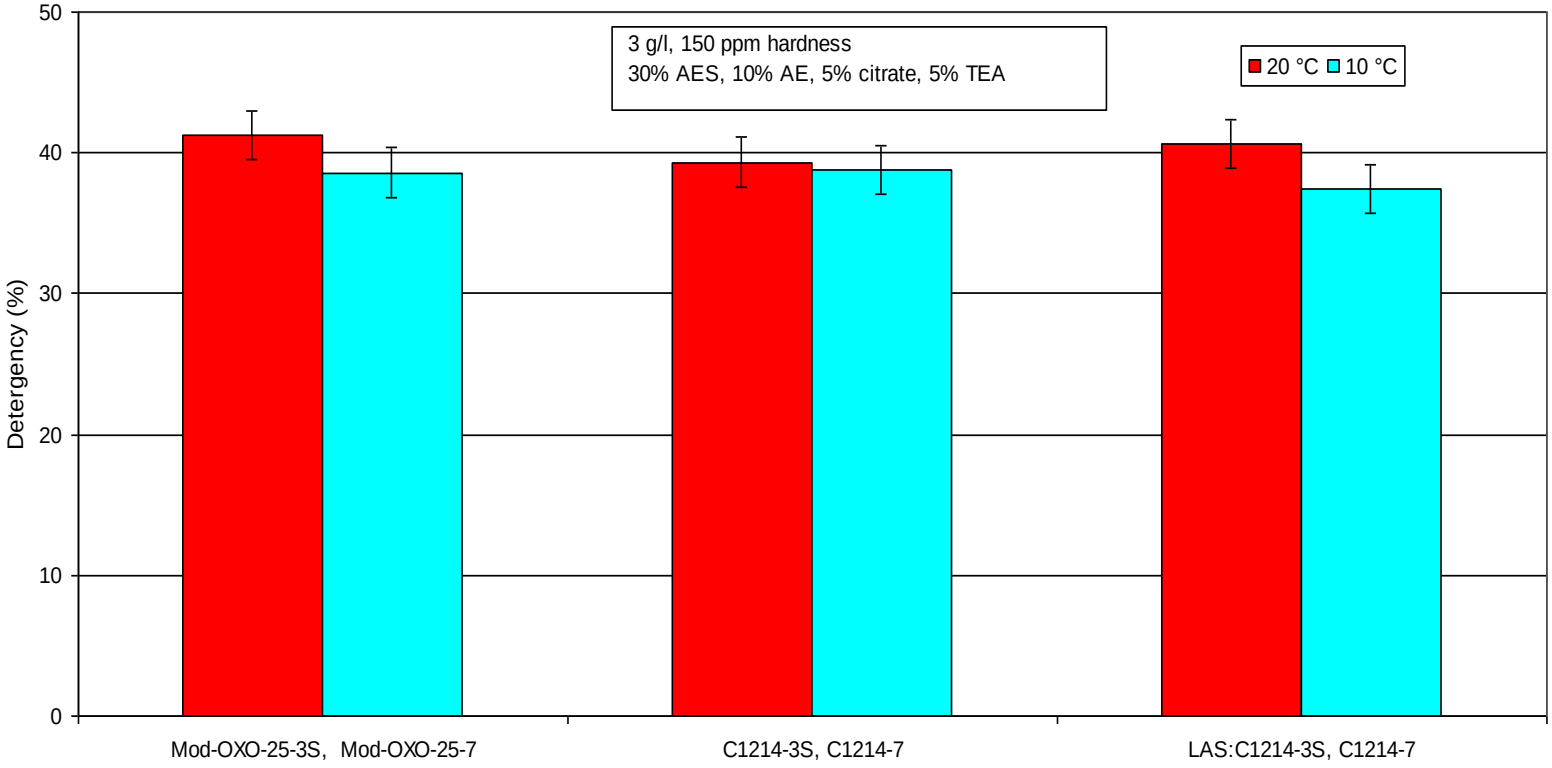
HDL and HDP at 20 °C



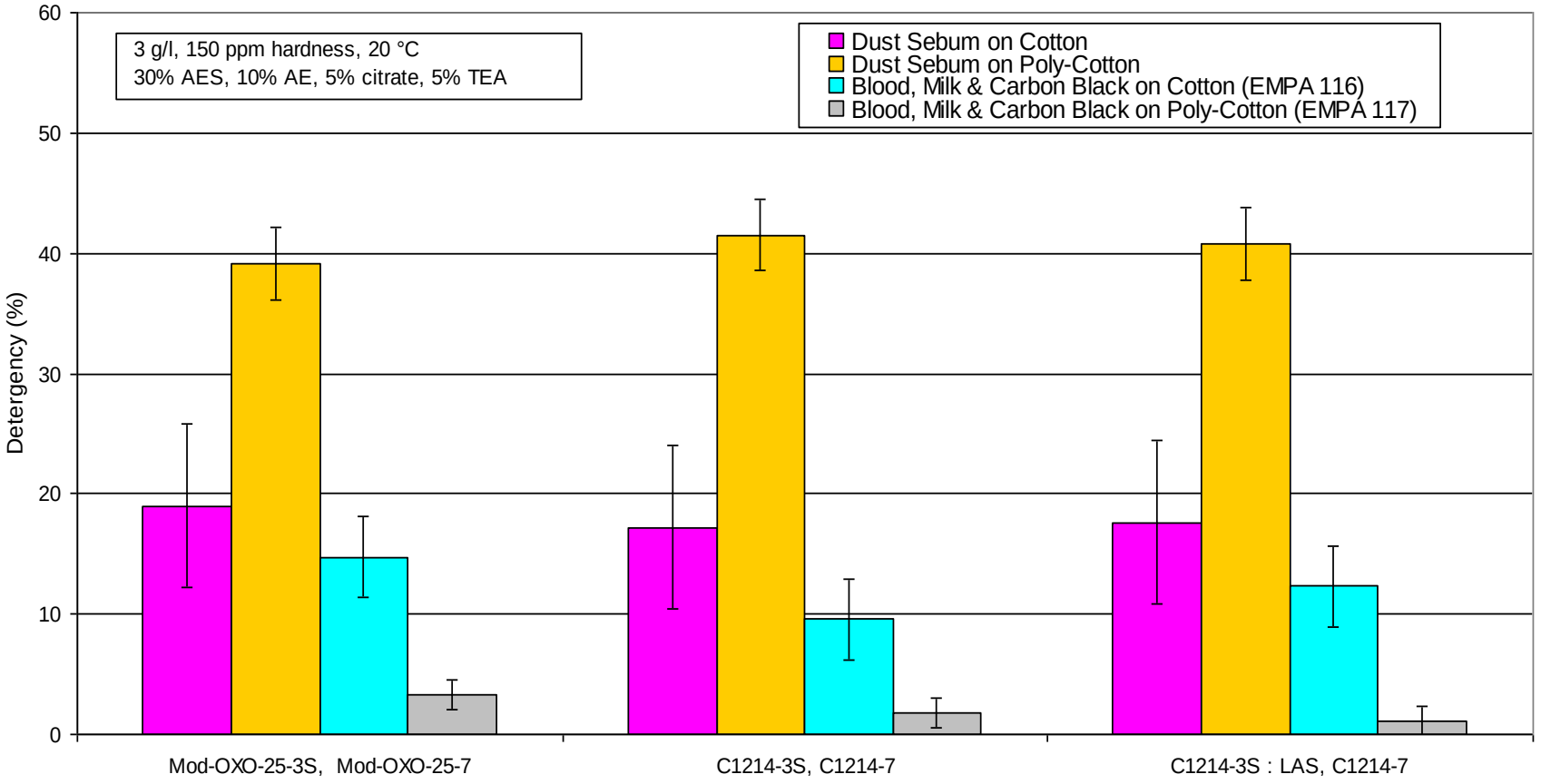
Heavy Duty Powder - AES/AE



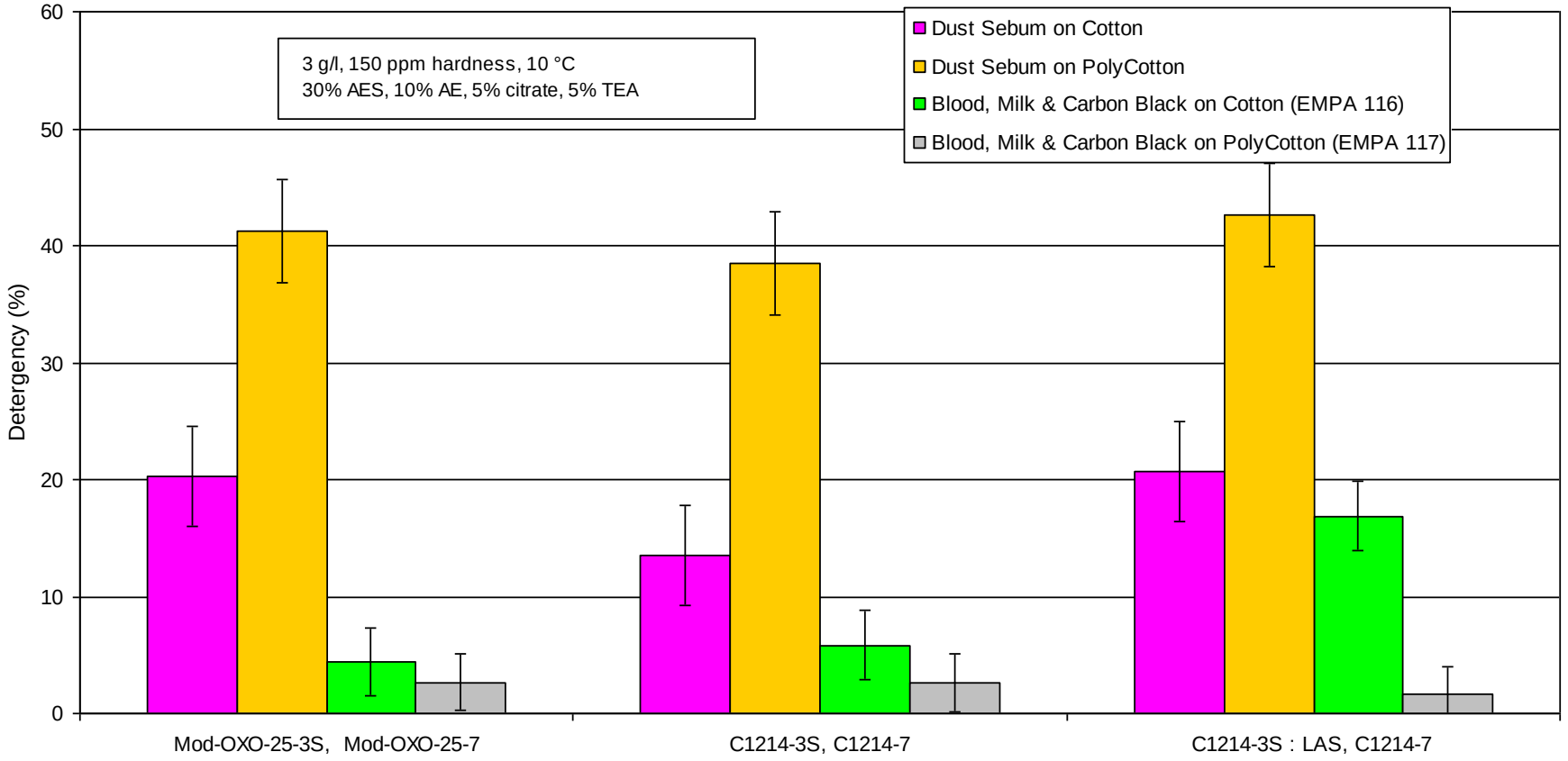
Heavy Duty Liquid - AES/AE



Reflectance Detergency of Heavy Duty Liquid, 20 °C



Reflectance Detergency of Heavy Duty Liquids, 10 °C



Conclusions

- The largest difference in performance is in dishwashing;
- Modest advantages exist for 2-alkyl branched surfactants for laundry; and,
- There are formulation stability advantages for mod-OXO alcohols in HDLs.

Acknowledgements

- Vicki Jud
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