



# A PREFORMED UREA THICKENER FOR GREASE

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**DOW RESTRICTED**

# WHY POLYUREA GREASE?

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- Inherent oxidative stability
- Thermal stability
- Excellent water resistance
- 3-5x life expectancy of Li and Li complex greases
- Popular for use in fill-for-life bearing systems and electric vehicles

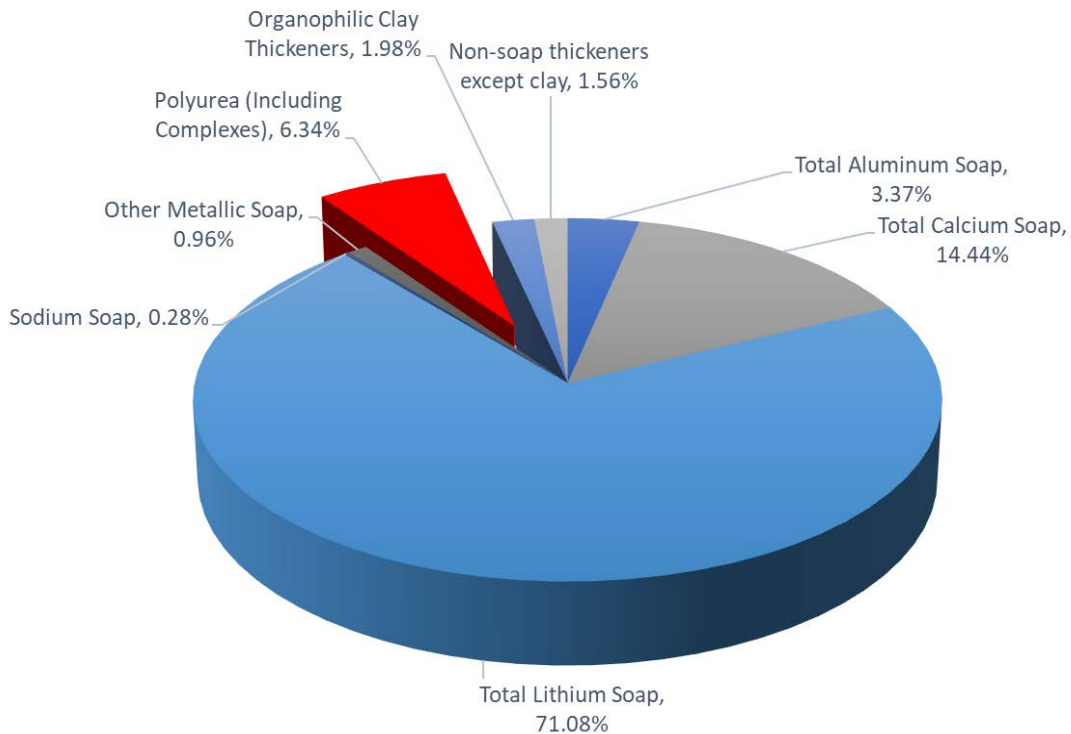
## Lithium greases under supply pressure

- Supply pressure on castor oil derivatives, essential for Li grease production
- Li price increasing due to use in batteries

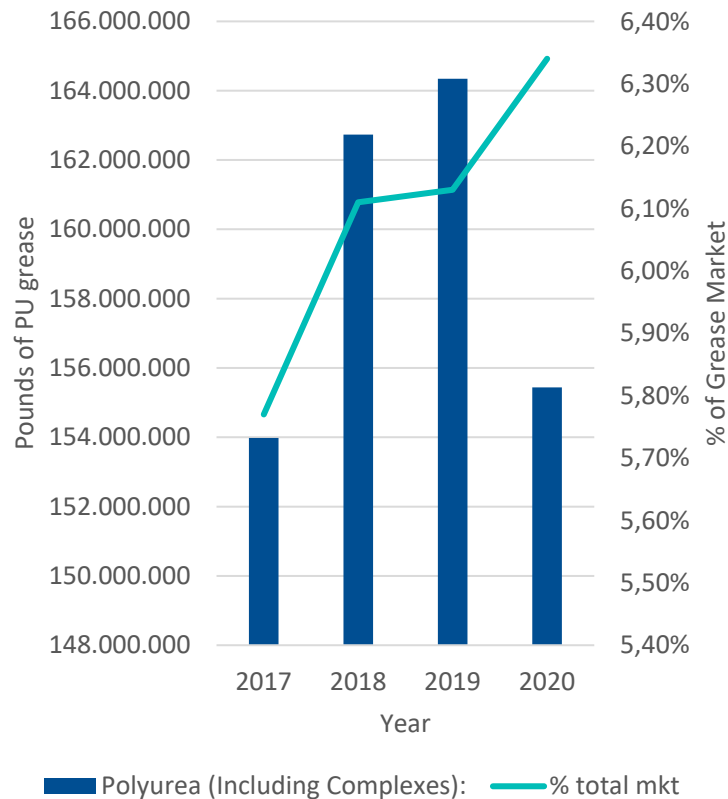


# GREASE MARKET OVERVIEW

## 2020 Total Grease Production (2.5B lbs)

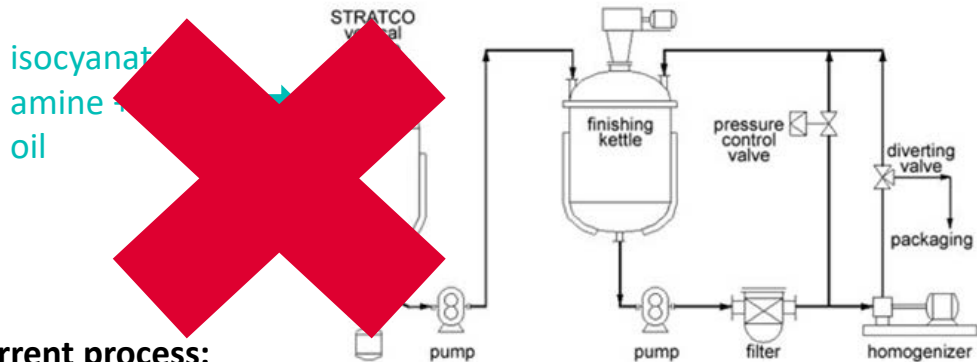


## PU Grease Market Share



# WHAT IS POLYUREA GREASE THICKENER?

Dow is developing a preformed polyurea thickener for the global lubricating grease market with competitive thickening performance and enhanced EH&S & handling benefits

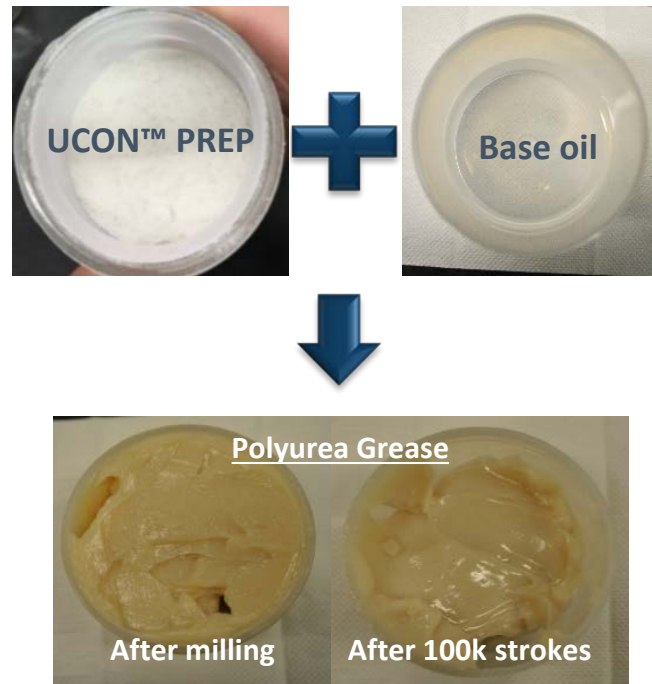


## Current process:

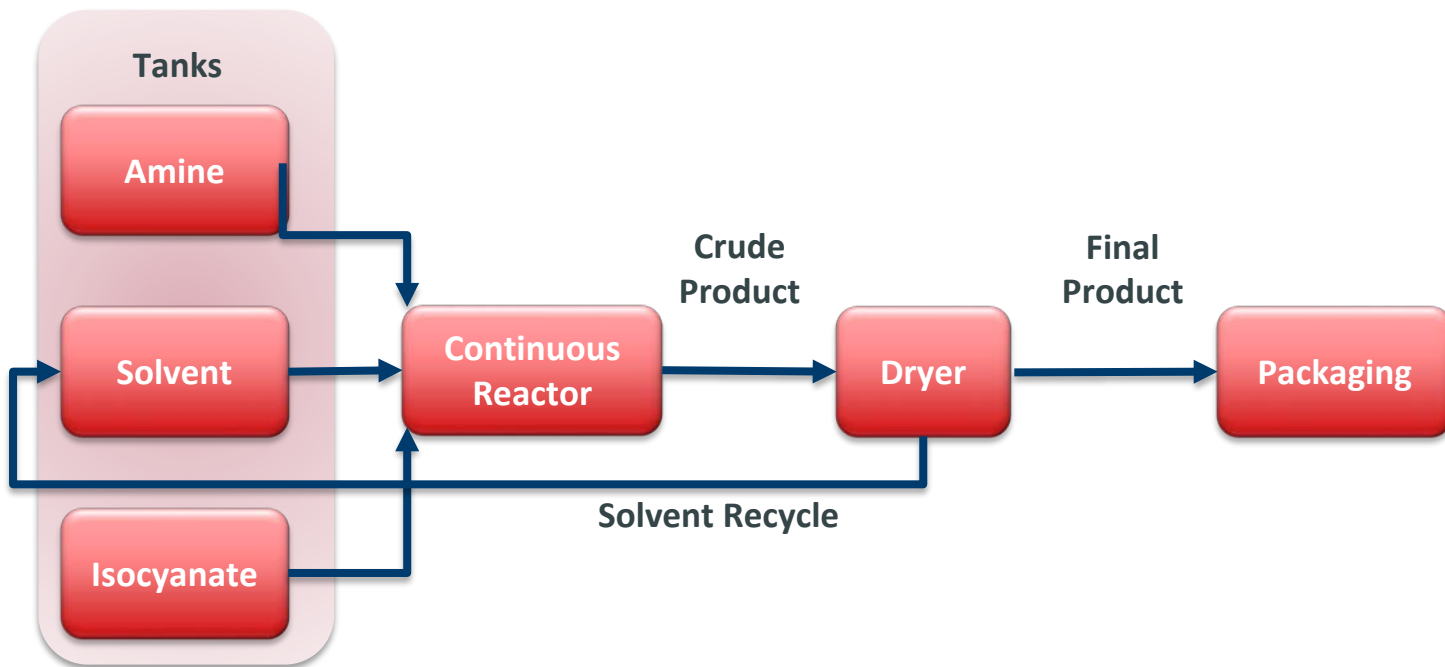
- Grease maker stores and handles isocyanates (toxic, reactive, short shelf life)
- Grease maker stores and handles amines

## Preformed product enables:

- Grease maker stores and handles a powder with good shelf life and minimal EH&S concerns- formulating vs making molecules
- No need for special equipment, engineering controls or special personnel training
- Use synthetic base stocks



# DOW SEMI-CONTINUOUS PROCESS



Zhe, J.; Cuthbert, J.B.; Maltoky, D.L; Saba, S.A.; Hook, B.D.; Wilmot, N.; Dermody, D.L. Method of Making a Grease Thickener and the Thickener Made by the Method. U.S. Patent Application 0324289 A1, 2021

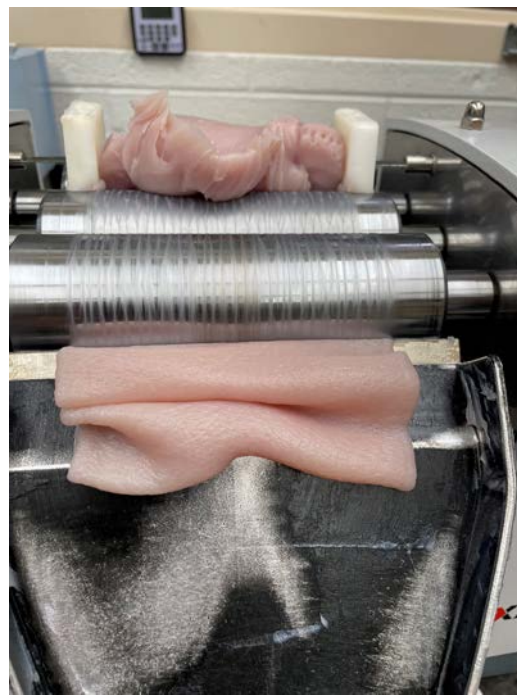
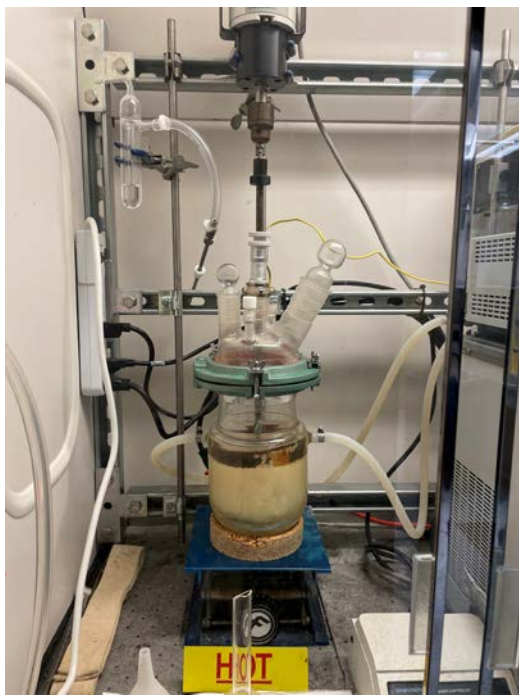
# SCALE UP AND PRODUCTION TRIAL

- Conducted safely during a global pandemic, before vaccines available
- Demonstrated desired production rate and scale
- Evaluated different methods for drying powder
- Obtained both paste and powder for further testing and sampling
- How do you determine product specifications for a new product?
  - Application testing
  - Customer sampling





# CURRENT GREASE APPLICATION TESTING – MAKE THE GREASE



Mix powder, base oils. Heat and agitate at 160 °C and 180 °C. Cool to 50 °C. Additives would be added here if used.

Mixture from reactor makes 3-6 passes through 3 roll mill.

# CURRENT GREASE APPLICATION TESTING – MEASURE PENETRATION



60 and 100K strokes in worker. 60 determines NLGI grade, 100K shear stability

NLGI Grade	Penetration at rt	Consistency Similar to
000	445 to 475	Thick cream
00	400 to 430	Tomato sauce
0	355 to 385	Mustard
1	310 to 340	/
<b>2</b>	<b>265 to 295</b>	<b>Tomato paste</b>
3	220 to 250	/
4	175 to 205	Soft cheese
5	130 to 160	Hard cheese
6	85 to 115	Wax

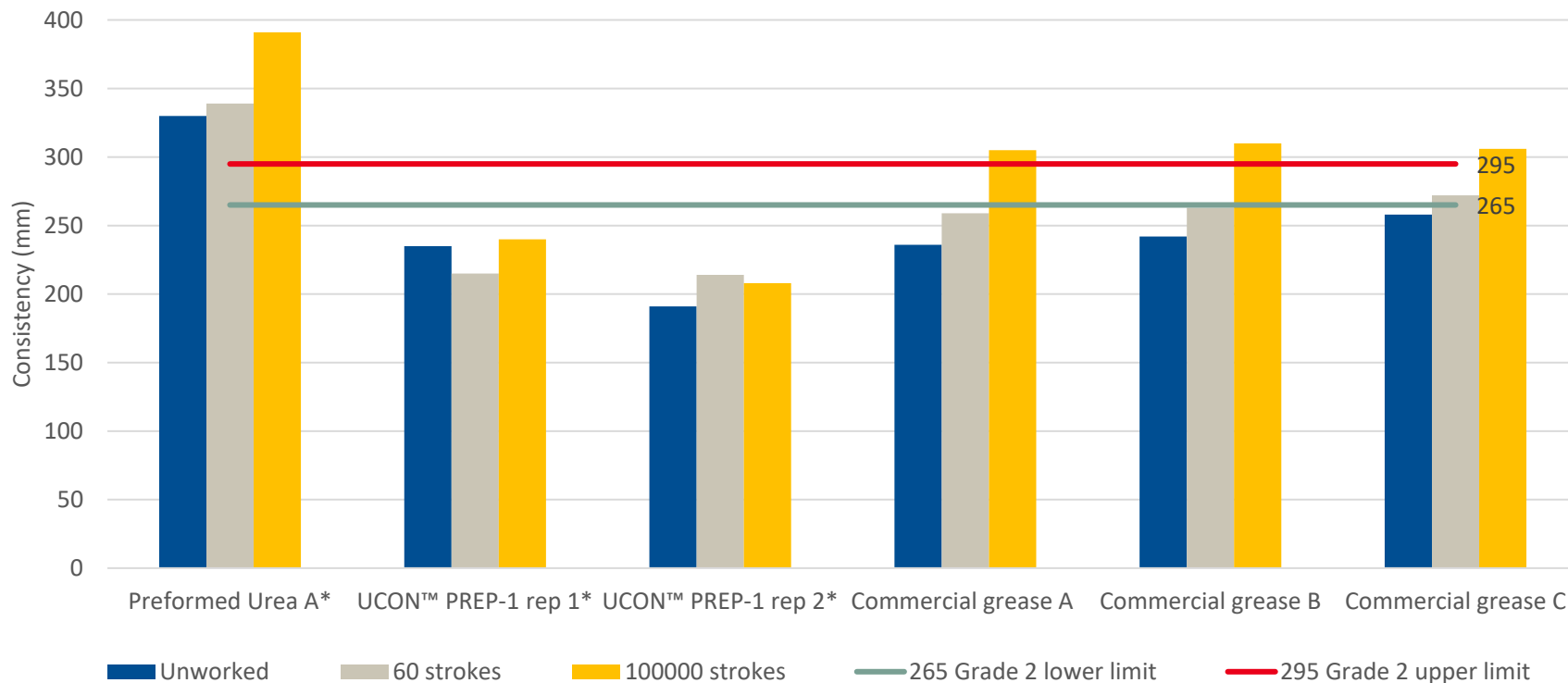
Penetrations measured. Smaller values, stiffer grease





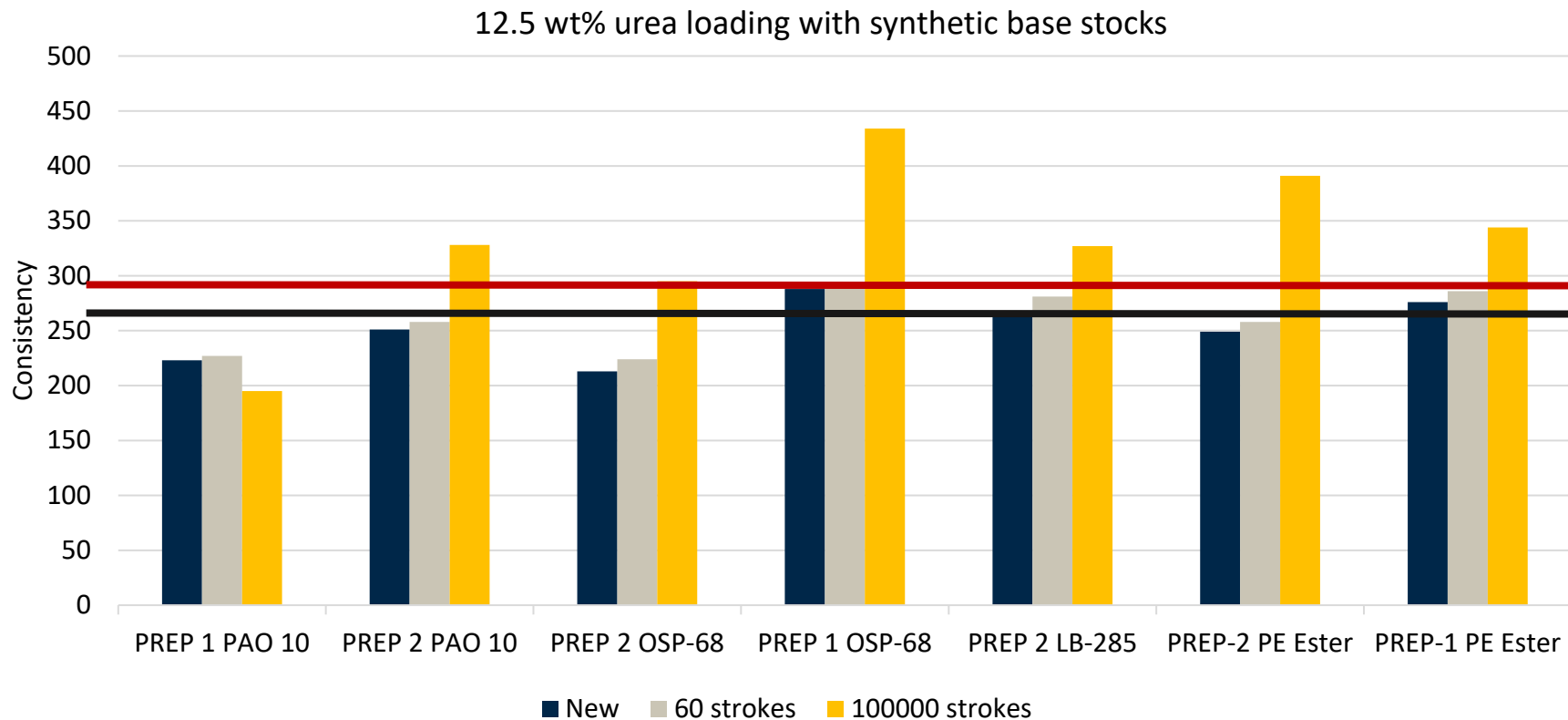
# GREASE SHEAR STABILITY

## UCON™ Prep 1 vs *In Situ* Made Commercial Grease and Preformed A



\*same thickener loading (12.5 wt %) for powder samples, Group II base oil

# GREASE PERFORMANCE IN SYNTHETICS – ACCESS TO NEW BASE STOCKS!



# SUMMARY

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- A powdered polyurea grease thickener is safer and easier to store and handle than isocyanates and amines.
- Lithium and hydroxystearic acid supply is tightening
- Preformed polyurea thickeners can be made at large scale with consistent quality
- Quality grease with good shear stability can be prepared from a preformed thickener in a variety of base stocks
- The process described is flexible, and different thickener structures can be accessed depending on needs



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