IMPROVED SAFETY LOCTITE® NEO TECHNOLOGY

(formerly known as LOCTITE NISO)

OLAF HARTMANN, HENKEL INDUSTRIAL ADHESIVES R&D

BACKGROUND
EPOXY AND POLYURETHANE ADHESIVES

Classic Reactive Adhesive Systems encounter limitations due to their nature…

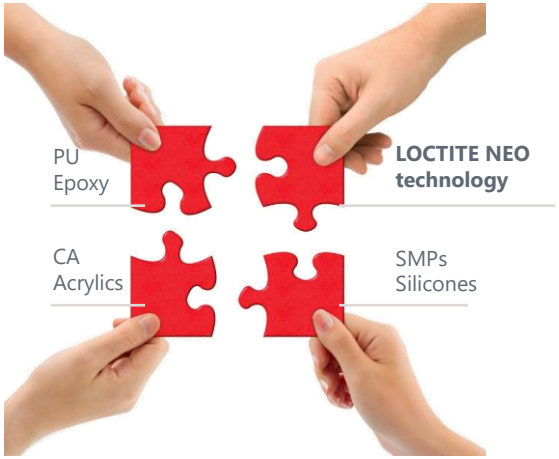
Health & Safety

- Epoxy: strong skin sensitizer, often containing Bisphenol-A
- PU: Isocyanates undergo stricter regulations by EU commission
  - Mandatory training for safe handling, AND
  - Lower Occupational Exposure Levels to be implemented by 2023

Performance

- Epoxy: high exotherms, long curing cycles
- PU: reaction with water leads to bubbling

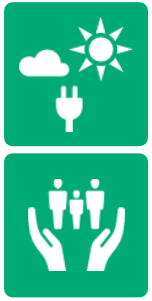
A CLEAR INNOVATION STRATEGY
LOCTITE® NEO TECHNOLOGY



An additional reactive adhesive technology with additional benefits
LOCTITE NEO is neither PU nor Epoxy!

Potential value for our customers

- Faster curing at low exotherm for **increased throughput**
- **Improved safety:** Free of isocyanates or any sources of PAAs
- **Increased tolerance:** No sensitivity with water, no foaming issues
- Broad primer-less multi-substrate adhesion …
- **Easy storage:** No need to worry about temperatures



| Water tolerance. 6.5% water added to LOCTITE NEO product (top) and typical PU product (bottom)

TECHNOLOGY INTRODUCTION
LOCTITE® NEO TECHNOLOGY

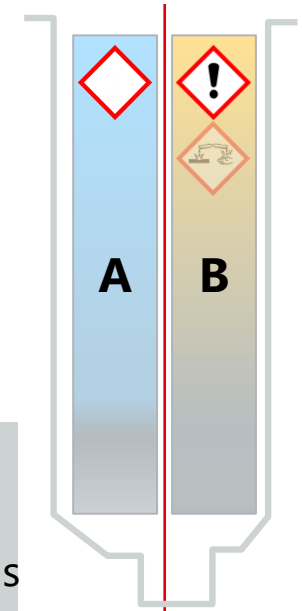
proprietary Henkel technology

Novel **2K reactive system**, solvent free
Compatible with standard mixing equipment

Part A

contains **adhesive resin**

- Label free
- Can contain fillers



Part B

contains hardener,
different hardeners for tunable properties:

- Fast curing to long open time
- Structural or Elastic adhesive
- Low to high T_g (up to 150 °C)
- Good chemical stability
- NO NOXIOUS CHEMICALS:
  no isocyanate, no toxic chemicals or CMRs
- Labeling dependent on hardener type

We work directly with the customer to shape the technology based on their needs

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LOCTITE NEO TECHNOLOGY

proprietary Henkel technology

LOCTITE NEO **Polycondensation**

- **Fast curing at low exotherm** for increased throughput
- Finely dispersed **water is generated** during curing
- Good **chemical stability**

Resin
LOCTITE NEO 1300

Hardener
LOCTITE NEO 2x00

spontaneous →

Polymer | |

LOCTITE NEO **Polyaddition**

- **Water free curing.** Allows for sensitive electronic applications
- **High thermal stabilities** and **Tgs** possible
- **Long open/fast cure** profiles possible
- **Higher exotherms**, but lower than epoxy

Resin
LOCTITE NEO 1300

Hardener
LOCTITE NEO 6xxx

catalyst →

Polymer |
(no water formed)

| LOCTITE NEO Polycondensation (top) and Polyaddition (bottom)

LOCTITE NEO offers *not only one,*
but two completely different curing mechanisms!

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POLYCONDENSATION VS POLYADDITION
MORE INFO

Water filtration prototypes

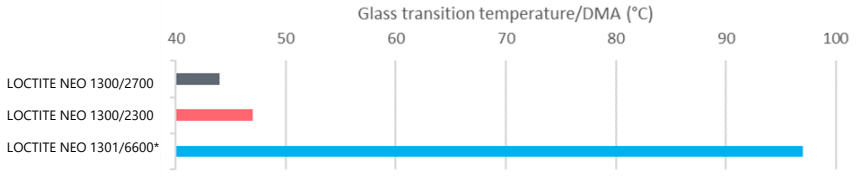
Grey and Red lines

Polycondensation
Fast systems at low exotherm

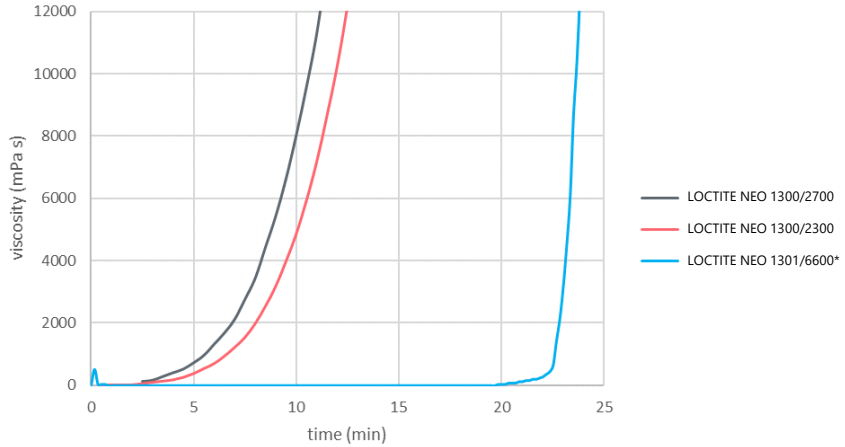
Blue line

Polyaddition
Water free polymer

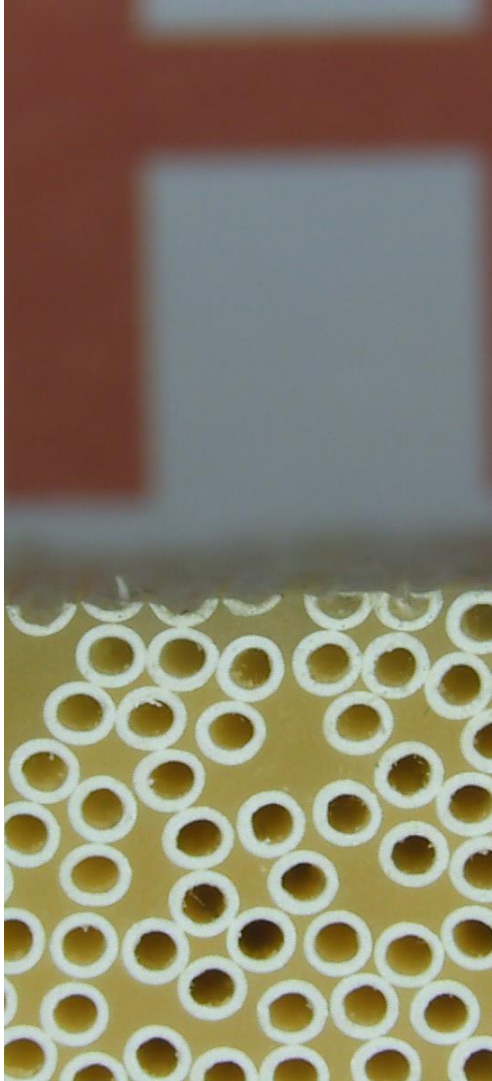
Choosing the right catalyst allows long open/fast cure



| Tg by DMA, single cantilever, 3 K/min, -30…120 °C, 1 Hz, 0.1% (for 1300/2300 and 2700) by DSC for 1301/6600, 3 K/min, -30…120 °C



| Pot life curve. Brookfield LV-T, spindle 7, 20 g in uncooled aluminum cup (1300/2300 and 2700), or in aluminum cup heated to 60 °C (1301/6600). Lower viscosity region (estimated penetration time). *experimental prototype

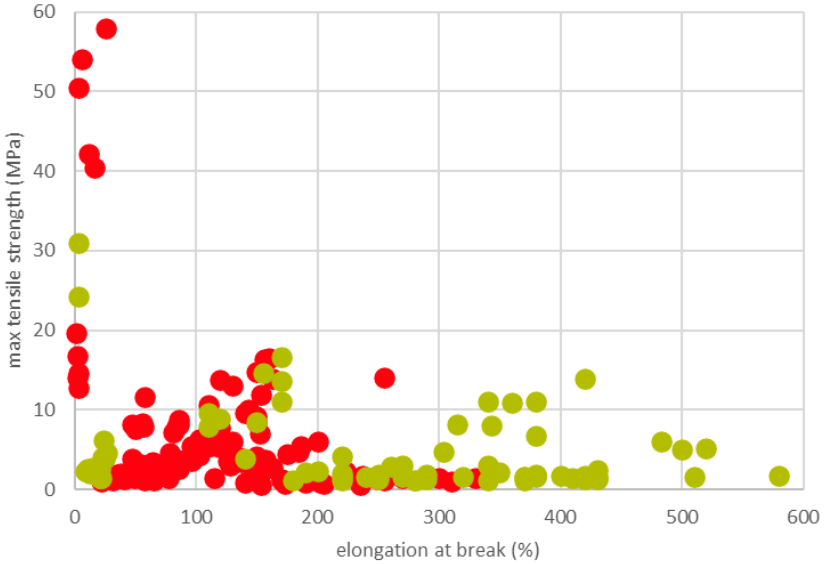


VERSATILE – MECHANICAL PROPERTIES LOCTITE® NEO TECHNOLOGY

proprietary Henkel technology

Tensile material properties of experimental LOCTITE NEO materials

- Only yield points shown
- Both filled and unfilled systems



| Yield points of experimental LOCTITE NEO materials from tensile stretch experiments according to DIN EN ISO 527.

- Wide range of material properties can be achieved, from stiff/structural to very elastic
- Good adhesion profiles

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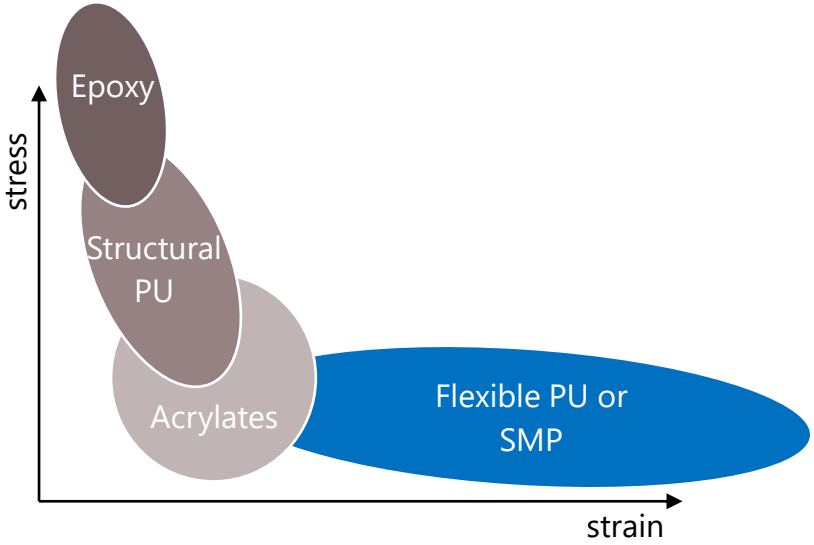
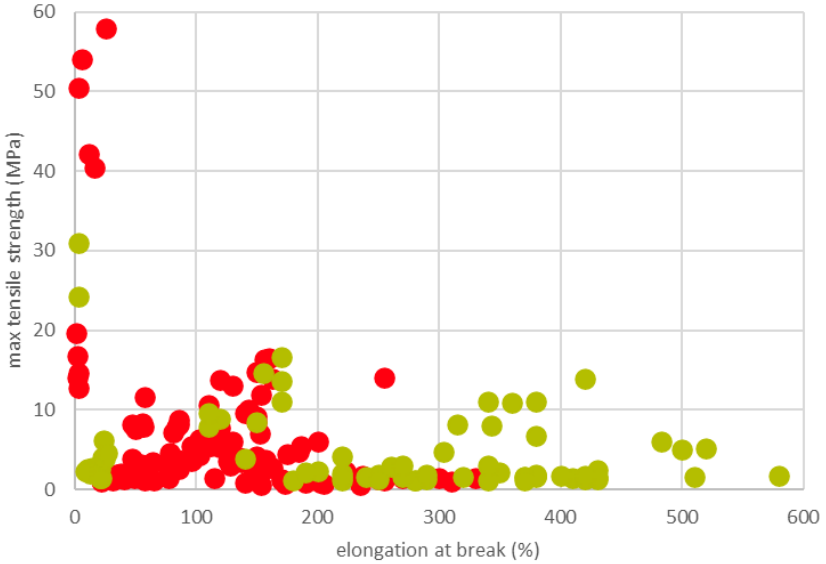
VERSATILE – MECHANICAL PROPERTIES LOCTITE NEO TECHNOLOGY

proprietary Henkel technology

Tensile material properties of established technologies



Tensile material properties of experimental LOCTITE NEO materials



| Yield points of experimental LOCTITE NEO materials from tensile stretch experiments according to DIN EN ISO 527.

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POTENTIAL APPLICATIONS
COMMERCIAL STATUS

- New alternative technology to the adhesive world
- First commercial application: filtration pottings launched in 2022.

commercial

experimental

- Working on expanding portfolio
- Many different applications from versatile mechanical properties
- Experimental prototypes (starting formulations) for many applications





LOCTITE® *NEO* TECHNOLOGY
FILLING THE GAP IN LIQUID FILTRATION

	Epoxy	Polyurethane	LOCTITE NEO
Chemical Resistance	High	Medium	Medium
Maximum Operation Temperature	High	Lower	Medium
Storage Stability	High	Lower	High
Moisture Sensitivity	None	High	None
Hardness	High	Low	Medium
Cure Speed	Slow	Fast	Fast
Exotherm	High	Low	Low
Noxious Chemicals	High	High	Low

In Red: larger source of **efficiencies and value creation** at the customer side

Climate

Saves you energy during production and storage

Health & Safety

Free of isocyanates, BPA, CMRs or silicone

Performance

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COMMERCIAL STATUS LOCTITE NEO

First application
Featuring the Polycondensation

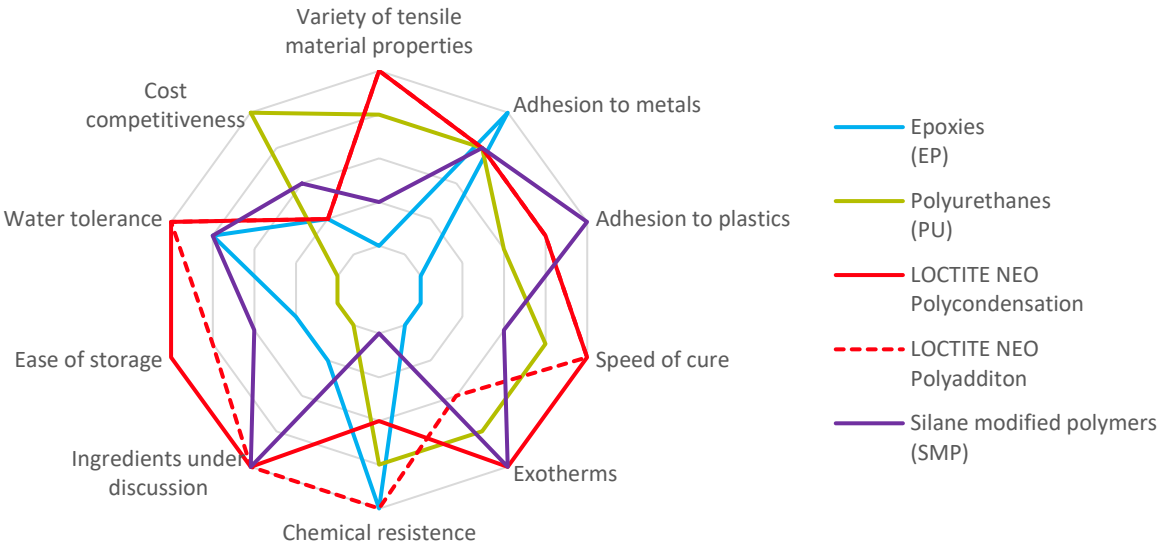
- One resin
  LOCTITE NEO 1300
- Three hardeners, tailored to performance and application needs
  - LOCTITE NEO 2300
    highest penetration potential
  - LOCTITE NEO 2700
    longest open time
  - LOCTITE NEO 2800
    higest Tg and hydrophobicity

Value

- Low water sensitivity
  reduce complexity of production
- Fast curing at low exotherm
  speed up production
- No CMR/sensitizers contained
  improved workers' safety
- High storage stability
  easy storage, no heated warehouse needed

TECHNOLOGY COMPARISON
GENERAL PROPERTIES

LOCTITE NEO vs mature technologies



- **Every technology has their benefits and challenges**
- LOCTITE NEO with strenghts in
  - Adhesion profile
  - Speed of cure
  - Customer safety
  - Moisture tolerance

LOCTITE NEO TECHNOLOGY

Adhesives, Sealants and Coatings based on modified polyol resins

Features/General info

- **Safer.** Free of isocyanates or other cancerogenic, mutagenic or reprotoxic compounds (CMR). No training needed
- **Tolerant.**
  No sensitivity with water, no foaming issues
- **Versatile.**
  Huge variety of achievable material properties
- **Sticks.**
  Broad primer-less multi-substrate adhesion, with strengths on plastic (PE, PP, PTFE similar to PU)
- **Easy storage.** No need to worry about temperatures
- Very **low viscosities possible** (< 200 mPas)
- New technology with good prototypes, but yet only a handful of commercial products

NEO Polycondensation

LOCTITE NEO 1xxx/2xxx

- **Fast curing at low exotherm** for increased throughput
- Finely dispersed **water is generated** during curing

NEO Polyaddition

LOCTITE NEO 1xxx/6xxx or 9xxx

- **Water free curing.** Allows for sensitive electronic applications
- High Tgs and **thermal** stabilities possible
- **Long open/fast cure** profiles possible with the right catalysts
- **Higher exotherms** than NEO Polycondensation, but lower than epoxy

CONACT INFORMATION

Henkel AG & Co KGaA

Industrial Adhesives R&D
Henkelstraße 67
40589 Düsseldorf
Germany

olaf.hartmann@henkel.com
LOCTITE NEO Technology Expert

THANK YOU.