Release Agents and Processing Aids for Rubber Molding
Chem-Trend Technology

Rubber in Automotive Conference- Troy, MI
June 13, 2017
Chem-Trend
Release Agents for a Wide Variety of Global Customers
Freudenberg Chemical Specialties

Business Units

- High degree of specialization and strong brands
- Focus on innovation
- Global reach with simultaneous local support capabilities

Specialty Lubricants
Special Release Agents
High-Performance Lubricants
Surface and Electro-Plating Technologies
Confectionary Coatings
Industry Segments

Composites

Die Cast

Polyurethane

Rubber

Thermoplastics

Tire

Wood Composite
Manufacturing Near Our Customers

Howell, USA (MP)

Norderstedt, Germany

Anseong, S. Korea

Howell, USA (GR)

Mysore, India

Qingpu, China

Valinhos, Brazil
The Rubber Industry
A wide variety of parts and customer needs
Rubber Parts We’re Talking About Today
Chem-Trend Release Technology Platforms

Semi-permanent Technology
Si-free Technology
Water-based Products
Mold Primers
Conventional Technology

Multiple products and technologies to meet ALL rubber molding requirements
Rubber Release Agents
How do they work?
What is Rubber Mold Release Agent?

A coating applied to a mold surface that:
1. Acts as a barrier between the mold and molded part
2. Imparts a film that allows the molded part to be removed easily from the mold

**Barrier**
- Protects the mold – Chemical

**Slip**
- Helps the part slide out – Mechanical

**Release Agent**
# Release Agent Technologies

<table>
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<th>Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| **Permanent Technology**          | ♦ No transfer to part  
♦ Long lasting  
♦ No release agents in plant                                           | ♦ Very expensive process  
♦ Molds need to be sent away  
♦ Coating easily damaged  
♦ Fixed “release-ease” |
| **Semi-permanent Technology**     | ♦ Very low transfer to part  
♦ Renewable in-situ  
♦ Variable release properties  
♦ Molds stay very clean  
♦ Infrequent application  
♦ Molds clean very easily | ♦ Need good spray equipment  
♦ Need discipline in application |
| **Conventional or Sacrificial Technology** | ♦ Low material cost  
♦ Easy to apply  
♦ High lubricity                                                     | ♦ Always transfer to part  
♦ Labor intensive  
♦ Need dilution equipment  
♦ High mold fouling |
| **Internal release agents**       | ♦ Part of the compound                                                     | ♦ Can affect physical properties  
♦ Can affect bonding capability  
♦ Often needs external RA help |
Semi-Permanent Mono-Coat® Release Technology
How does it work and key development factors
Active Functional Groups – This is what bonds together to create semi-permanence

Additional slip component is added when more lubricity is needed for complex geometries
Development factors – details to consider

• Geometry

• Mold substrate (steel, chromed, etc.)

• The rubber compound
  – Elastomer type
  – Compound hardness
  – Compound cure system
  – Compound fillers
  – Rubber to metal bonding

• Application equipment

• Post molding considerations
Mono-Coat® Release Technology
The development of two new products
Development of a Mono-Coat®

• Rubber to metal bonding application

• Customer wanted more durability low/no transfer, easier release to prevent defects, less mold fouling

• Customer items submitted for development:
  – Two natural rubber stocks for product development
    • Compound A: 40 durometer
    • Compound B: 70-80 durometer
  – Primer and adhesive
  – Current release agent as a control
Mono-Coat® vs Control: Durability

Basic Release Screening on Flat Panels to Baseline Performance
Mono-Coat® vs Control: Durability

NR Compound A – 40 Durometer

- Mono-Coat® Sample A
- Mono-Coat® Sample B
- Control

Diagram showing release force over runs for different samples.
Mono-Coat® vs Control: Durability

NR Compound B – 70-80 Durometer

- Mono-Coat® Sample A
- Mono-Coat® Sample B
- Control
NR Compound B 70-80 Durometer

Control – After 4 releases film degradation observed

Mono-Coat® Sample B – After 4 releases no film degradation
Mono-Coat® vs Control: Mold Fouling

Test Parameters

• Cavity molding

• Metal coated with primer and adhesive

• Prebake coated metal in mold

• Mold part with coated metal
Mono-Coat® vs Control: Mold Fouling

NR Compound B – 70-80 Durometer

Control – After 5 releases

Control – After 10 releases

Control – After 13 releases

Adhesive staining and rubber fouling/build-up observed on the mold surface
Mono-Coat® vs Control: Mold Fouling

NR Compound B – 70-80 Durometer

Mono-Coat® Sample A – After 5 releases
Mono-Coat® Sample A – After 10 releases
Mono-Coat® Sample A – After 16 releases

Light adhesive staining observed on the mold surface, some rubber build-up after 16 releases
**Mono-Coat® vs Control: Mold Fouling**

**NR Compound B – 70-80 Durometer**

Adhesive staining observed, but little rubber fouling/build-up observed on the mold surface

Staining can be solved with a formulation modification
Mold Fouling vs Durability

NR Compound B – 70-80 Durometer Cavity Molding Test

Easy

Difficult

Control

Mono-Coat® Sample A

Mono-Coat® Sample B
Mono-Coat B shows better wetting characteristics which is a variable for better product performance.
Results = Two New Products for the Market

• Sample A = Mono-Coat® 1589W
  – Good overall performance with regards to release, mold fouling and staining
  – Softer polymer film, better for softer rubber compound and parts with complex geometry that require more slip

• Sample B = Mono-Coat® C1892W
  – Superior durability and good resistance to mold fouling
  – Modified to improve staining with final formulation
  – Maximum durability for NVH applications and natural rubber molding
  – Provides mold protection for abrasive rubbers
  – Build-up in mold cavity is extremely low
  – Mold cleaning interval much higher

Part geometry and rubber compound factor into product selection
Mono-Coat® Release Technology
How to use it to optimize performance
Timely touch-up coats = Better release

Mono-Coat® C1892W
Comparison of Touch-up Regimen on Release Ease
EPDM, Sulfur Cured

Touch up before failure or difficult release maximizes release ease and durability
Timely touch-up coats = Lower build-up

More frequent touch-ups minimizes mold build-up
Other Chem-Trend Innovations
Rubber Cleaning Compound

Dirty Mold Cavities

Dirt and build-up on the used Chem-Trend® IPMC-1100

Clean Mold Cavities after Chem-Trend® IPMC-1100

Chem-Trend® IPMC-1100 co-formulated with FST

Cleans the mold without pulling the tool off-line

Extreme time saver for customers
Passivating chemistry offers semi-permanence but through a different mechanism.
Mold releases that passivate the mold surface
“Semi” Semi-Permanence
“Semi” Semi-Permanence
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