Cross section of PVD-coating

Cross section Dylyn®/DLC 200 nm

Cross section of PVD-coating

Coatings that improve uptime and reduce maintenance

Dylyn®/DLC coatings for plastic injection
What kind of coating properties can improve the uptime of your injection machines?

In plastic part manufacturing it is all about uptime and increasing speed. Maintenance cycles are a crucial component of manufacturing costs. DLC coatings can bring you to the next level...

Moving mold parts and form giving mold parts: unique coating recipes

We have separated mold components into two functional groups having unique functions and for this reason use different types of coatings for each group. The reasons for the group split and the unique properties that optimize coating performance for each group are shown below.

**Moving mold components**

**Unique benefit:** reduce operational costs by increasing lifetime of mold components

- Less wear so longer life of moving parts
- Less galling
- Increased protection against corrosion
- Less or even no need of lubricants
- Less or even shorter start up times
- Less maintenance and downtime

**Moving parts that perform better with Bekaert Dylyn®/DLC**

- Ejector pins, sliders, thread cores, ejector sleeves, leader pins, collapsible cores, wear plates, ...

**Form-giving mold components**

**Unique benefit:** increase uptime by lubricant free production

- Less build up of residues on the mold surface
- Better protection against corrosion
- Less abrasive wear
- Better protection of the surface against scratches
- No increase of roughness after coating
- Preservation of release properties

**Moving parts that perform better with Bekaert Dylyn®/DLC**

- Cores used on PET preforms or syringes, blow molds using PET preforms for bottles and tubes, mold cavities used in the manufacturing of lenses, cell phone screens or caps & closures, ...

Cost savings analysis

Find out if your company will benefit from the use of Dylyn®/DLC coatings. Calculate potential cost savings by inputting real operating figures. Send a mail to info@bekaert.com and we will send the calculation sheet to you.
What kind of coating properties can improve the uptime of your injection machines?

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**Moving mold components**

**Unique benefit:** reduce operational costs by increasing lifetime of mold components

- Less wear so longer life of moving parts
- Less galling
- Increased protection against corrosion
- Less or even no use of lubricants
- Less and shorter start and stop of machines

Moving parts that perform better with Bekaert Dylyn®/DLC:

- Ejector pins, sliders, thread cores, ejector sleeves, leader pins, collapsible cores, wear plates, ...

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- Cores used on PET preforms or syringes, blow molds using PET preforms for bottles and tubes, mold cavities used in the manufacturing of lenses, cell phone screens or caps & closures, ...

**Your added value**

- High wear resistance
- No change of mold design needed
- Little or no lubricants needed
- Consistent release
- No galling or cold welding
- Less maintenance

**Coating properties**

- Low surface energy
- Low coating thickness (2-3µm)
- Low microporosity
- Low deposition temperature
- High hardness
- Biocompatible
- Low friction
- Conformal coating

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What kind of coating properties can improve the uptime of your injection machines?

In plastic part manufacturing it is all about uptime and increasing speed. Maintenance cycles are a crucial component of manufacturing costs. DLC coatings can bring you to the next level...

Moving mold parts and form giving mold parts:

Moving mold parts
Unique benefits: reduce operational costs by increasing lifetime of mold components
- Less wear so longer life of moving parts
- Less galling
- Increased protection against corrosion
- Less or even in case of lubrication: less or even faster 
- Less maintenance and stops of machines

Moving parts that perform better with Bekaert Dylyn®/DLC
- Ejector pins, sliders, thread cores, ejector sleeves, leader pins, collapsible cores, wear plates, …

Form-giving mold parts
Unique benefit: increase up time by lubricant free production
- Less build up of residues on the mold surface
- Better protection against corrosion
- Less abrasive wear
- Better protection of the surface against scratches
- No increase of roughness after coating
- Preservation of release properties

Moving parts that perform better with Bekaert Dylyn®/DLC
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Coatings that improve uptime and reduce maintenance

Overall characteristics of Dylyn®/DLC
- Coating thickness varies from 0.5 µm – up to 5 µm possible
- Coating of difficult shapes and geometries are in general no problem

<table>
<thead>
<tr>
<th>Coating Type</th>
<th>Microhardness</th>
<th>Coefficient of Friction</th>
<th>Surface Energy (mN/m)</th>
<th>Working Temperature</th>
<th>Deposition Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dylyn®/DLC</td>
<td>3000</td>
<td>0.1 - 0.2</td>
<td>20 - 30</td>
<td>600° F</td>
<td>&lt; 200° C</td>
</tr>
<tr>
<td>Dylyn®</td>
<td>1800</td>
<td>0.1 - 0.2</td>
<td>20 - 30</td>
<td>570° F, 290° C</td>
<td>2&lt;200° C</td>
</tr>
<tr>
<td>PACVD Dylyn®/DLC</td>
<td>5000</td>
<td>0.1 - 0.2</td>
<td>20 - 30</td>
<td>570° F, 290° C</td>
<td>2&lt;200° C</td>
</tr>
</tbody>
</table>

- Coatings that improve uptime and reduce maintenance
- Coating types
- Overall characteristics of Dylyn®/DLC
  - Coating thickness varies from 0.5 µm – up to 5 µm possible
  - Coating of difficult shapes and geometries are in general no problem
- Coatings for plastic injection

For comparison:
- TiN: Microhardness 2300, coefficient of friction 0.4 - 0.5, working temperature 840° F, deposition temperature 482 - 932° F
- Chrome: Microhardness 1000, coefficient of friction 0.2 - 0.4, working temperature 600° F, deposition temperature 122 - 176° F
- Nickel Teflon: Microhardness 800, coefficient of friction 0.1 - 0.2, working temperature 480° F, deposition temperature 122 - 176° C

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Coatings that improve uptime and reduce maintenance

Coatings types

Overall characteristics of Dylyn®/DLC
- coating thickness varies from 2-3µm - up to 8µm possible
- coating of difficult shapes and geometries are in general no problem

<table>
<thead>
<tr>
<th>Coating type</th>
<th>Microhardness (Vickers)</th>
<th>Microhardness (Rc)</th>
<th>Coefficient of friction (against steel)</th>
<th>Surface energy (mN/m)</th>
<th>Working temperature (°C)</th>
<th>Deposition temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dylyn®/DLC</td>
<td>2800-86</td>
<td>80-18</td>
<td>0.12</td>
<td>42</td>
<td>570</td>
<td>299</td>
</tr>
<tr>
<td>Dylyn®</td>
<td>1600-79</td>
<td>80-89</td>
<td>0.05</td>
<td>30</td>
<td>750</td>
<td>450</td>
</tr>
</tbody>
</table>

For comparison:
- TiN: 2300-88, 0.4-0.5, 40-42, 840° F, 450° C, 482-1210° F, 250-800° C
- Chrome: 1000-85, 0.2-0.4, 50-60, 600° F, 325° C, 122-260° F, 50-80° C
- Nickel Teflon: 800-49, 0.1-0.2, 20-30, 480° F, 250° C

TiN coatings are characterized by a high microhardness and very low coefficient of friction.

Dylyn®/DLC coatings for plastic injection

For more information on coating types and applications, please contact your local Bekaert office.