**NDF** – Non-Degrading Flakes

Description & General Information

- **NDF** pigments are designed specifically to provide increased shear stability versus traditional Cornflake and Silver Dollar flakes while providing excellent brightness, flop, sparkle and color stability.

- **NDF** pigments are suitable for conventional paint systems. On request and based on the application, we can offer stabilized pigments for water-based systems.

- **NDF**’s are more stable in circulation systems than conventional Aluminum pigments.

- **NDF**’s are thicker than traditional silver dollar and cornflake pigments.

- **NDF**’s come in a wide variety of particle sizes (D50 of 12 μm up to 34 μm) and are supplied in paste form.

- ECKART America has almost 20 years of experience in manufacturing NDF pigments.

Application Areas

NDF’s are used for a wide field of applications, such as:

- Automotive OEM & Accessories
- Coil coatings
- Wheel rims
- Packaging - exterior and interior food can coatings
- Graphic Arts applications - flexographic and gravure printing
NDF – Non-Degrading Flakes

Pigment Characteristics / Morphologies (Aspect Ratio)

- **NDF**'s pigments provide improved shear stability due to increased thickness and edge uniformity.

- Improved shear stability means the pigment will not lose brightness and flop during high stress applications, e.g. in automotive recirculation systems / coil applications.

![Aspect Ratio Diagram](image)

**Better shear stability**

**Better Coverage and Hiding power**

**SEM pictures:**

![NDF SEM](image)

![Silver Dollar SEM](image)
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Shear Stability

**Shear Stability** is described as the property of a pigment flake to retain structure, color, brightness and flop when exposed to a high shear situation.

When pigments are exposed to high shear forces, such as in paint recirculation systems, they can experience physical damage to the flake perimeter, and in worst cases actual fractures to the flakes. This damage will result in an appearance change which is normally observed as a decrease in color, brightness and flop.

Shear stability is a concern in the Automotive and Coil Coatings Industries, and other applications where liquid paint is exposed to high shear.

NDF pigments offer the solution: Superior shear stability, unique color position with excellent brightness, color stability and flop:

**Shear Stability** is influenced by several factors:
- Pigment Structure / Morphology
- Paint System – high solids vs. low solids and solventborne vs. waterborne
- Application System – Pumps, paint recirculation, roller applicator, high speed ‘bell’ cup

In order to determine pigment stability properties, Laboratory Test Methods are used to simulate the shear in Automotive OEM paint recirculation systems, e.g., Waring Blender Test.

Illustration after Waring Blender test: Deviation in L* (15°) between “unsheared” and “sheared” paint application. Measured with Spectrophotometer (e.g. BYK-mac).
## NDF – Standard Product Portfolio

<table>
<thead>
<tr>
<th>NDF</th>
<th>Visual effect</th>
<th>D10</th>
<th>D50</th>
<th>D90</th>
<th>NVM</th>
<th>Shear</th>
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</thead>
<tbody>
<tr>
<td>NDF 120</td>
<td>fine</td>
<td>6</td>
<td>12</td>
<td>20</td>
<td>70</td>
<td>semi</td>
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<tr>
<td>NDF 130</td>
<td>medium – fine</td>
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<td>13</td>
<td>23</td>
<td>70</td>
<td>semi</td>
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<tr>
<td>NDF 150</td>
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<td>15</td>
<td>24</td>
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<td>NDF 165</td>
<td>medium</td>
<td>8</td>
<td>17</td>
<td>30</td>
<td>80</td>
<td>non</td>
</tr>
<tr>
<td>NDF 170</td>
<td>medium</td>
<td>9</td>
<td>17</td>
<td>29</td>
<td>80</td>
<td>non</td>
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<tr>
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<td>20</td>
<td>30</td>
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<tr>
<td>NDF 340</td>
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<td>17</td>
<td>34</td>
<td>56</td>
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</tbody>
</table>
### NDF 2000 – Enhanced Product Portfolio

- Brighter metallic effect
- Increased flop / travel
- Comparable tint strength (to Standard Product Portfolio)

<table>
<thead>
<tr>
<th>NDF</th>
<th>Visual effect</th>
<th>D10</th>
<th>D50</th>
<th>D90</th>
<th>NVM</th>
<th>Shear</th>
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<tr>
<td>NDF 2140</td>
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<td>22</td>
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<tr>
<td>NDF 2180</td>
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<td>19</td>
<td>30</td>
<td>75</td>
<td>non</td>
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</tbody>
</table>

### NDF 3000 – Premium Product Portfolio

- Narrowed particle size distribution
- Brighter metallic effect
- Increased flop / travel
- Higher color purity
- Comparable tint strength (to Standard Product Portfolio)

<table>
<thead>
<tr>
<th>NDF</th>
<th>Visual effect</th>
<th>D10</th>
<th>D50</th>
<th>D90</th>
<th>NVM</th>
<th>Shear</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>NDF 3150</td>
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<td>16</td>
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<tr>
<td>NDF 3250</td>
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</tbody>
</table>
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Particle size distribution

**Particle size distribution (CILAS 1064)**

- **Standard NDF Portfolio**
- **Premium NDF Portfolio**

Diameter in microns
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