COLOUR CONCENTRATE

Technology:
Colouring glass in the forehearth of a glass melting furnace is currently used worldwide in all segments of the glass industry, including bottles, cosmetic containers, table ware and architectural glass. The colour concentrate is added to the molten glass in the forehearth and is subsequently homogeneously stirred into the glass. Compared to traditional tank colouring, this technique is especially beneficial for making specialty colours in relatively short production runs. The advantages of the system are:

- Increased flexibility
- Fast colour change over times.
- Lower inventory.
- Capability to quickly respond to (changing) market demand.
- Adding specialty colours to your product range / acquiring new business
- Minimizing in-between colour production losses during colour changes.

Colorobbia Colour Range
Colorobbia can provide the following range of standard colours:

<table>
<thead>
<tr>
<th>Product</th>
<th>Colour</th>
<th>Feed Rate</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPV-10710</td>
<td>Black</td>
<td>3.5 - 4.0%</td>
<td>1250 - 1260 C.</td>
</tr>
<tr>
<td>VPV-10610</td>
<td>Cobalt Blue (30%)</td>
<td>0.2%</td>
<td>1250 - 1260 C.</td>
</tr>
<tr>
<td>VPV-10611</td>
<td>Cobalt Blue (15%)</td>
<td>0.4%</td>
<td>1250 - 1260 C.</td>
</tr>
<tr>
<td>VPV-10612</td>
<td>Copper Blue (30%)</td>
<td>1.6%</td>
<td>1250 - 1260 C.</td>
</tr>
<tr>
<td>VPV-10309</td>
<td>Yellow Green (6% Cr2O3)</td>
<td>3.0%</td>
<td>1290 - 1300 C.</td>
</tr>
<tr>
<td>VPV-10310</td>
<td>Emerald Green (12% Cr2O3)</td>
<td>1.5%</td>
<td>1290 - 1300 C.</td>
</tr>
<tr>
<td>VPV-10502</td>
<td>Dead Leaf Green</td>
<td>3.0%</td>
<td>1290 - 1300 C.</td>
</tr>
<tr>
<td>VPV-10205</td>
<td>Amethyst</td>
<td>1.8%</td>
<td>1250 - 1260 C.</td>
</tr>
</tbody>
</table>

The indicated average feed rates represent the colour shades and colour intensities currently most commonly used. Feed rates may vary depending on glass temperature, atmosphere, glass composition and glass thickness. In addition to these standard colours, we are able to provide special colours on customer demand. Our Customer Service Laboratory can provide colour matches to meet your specific needs.
Advantages Colorobbia Colour Concentrates

The shape, particle size (3 – 9 mm) and the absence of dust makes the product better in weighing and metering to the forehearth. The absence of dust is not only an advantage environmentally for the operators. It also means that no dust in blown due to overpressure to the forehearth superstructure, which is an advantage in terms of the feeder refractory life time. The particular shape of the material results in smaller surface area getting in touch with the molten glass and this combined with the other physical and chemical properties leads to a low degree of reactivity between the glass and the concentrate. The concentrate is melting gently and smoothly resulting in less glass defects.

✓ Spherical shape
✓ Particle size
✓ Virtually dust free
✓ Smooth melting
✓ Low reactivity
✓ Less glass defects

Forehearth Design and Operation:

The design of a colourant forehearth depends on the required capacity, the articles manufactured and the colours desired. The colouring section should be considered as an extension to what would be considered as a normal length for cooling and conditioning the glass and to the required gob temperatures. The colouring section is designed to properly melt the concentrate and to provide good colour homogeneity. The design parameters are related to firing power, type of burners, channel length, width and depth and the glass depth. To provide the higher temperatures required in many cases a double stack of burners or oversize burners are recommended. The channel dimensions and the pull determine the residence time. In addition to sufficient temperature capability, sufficient residence time must be provided to provide proper melting and degasing capabilities. Other than temperature, a good control of the forehearth atmosphere is very important. The atmosphere has a crucial influence on colour development. To obtain good colour homogeneity the number of stirrers, the stirrer type and the configuration is important. We will aid you to maintain the proper operating parameters to obtain optimum results.

Information and recommendations (parameters, indicators, figures and/or specifications) contained herein are based on sources considered to be dependable, and is accurate and reliable on the best of our knowledge.

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