



Gansons Nauta™ Mixer: An Apt Solution for Pigment Blending in the Cement Industry

Background

Pigment blending is an indispensable unit operation in the cement industry. Inorganic pigments exhibit good stability due to their insolubility in water and can easily integrate in the cement matrix. Hence, they are used to impart different shades and prevent leaching phenomenon of concrete and lime-based building components. Additionally, natural inorganic pigments exist in the form of agglomerates and are required to be broken down into primary particles for optimum colour and performance.

Challenge

A chemical manufacturer was facing challenges in terms of improper product discharge, shade variation, presence of dead spots of unmixed material and aggregates in pigment blending on a ribbon blender.

Equipment Description

Gansons proposed conducting the trials in the Gansons Nauta™ Mixer to overcome the above-mentioned challenges. The Nauta™ mixer consists of a conical screw that rotates around its own axis and simultaneously around the axis of the conical body (Figure 1). The conical screw mixers exhibit a three-dimensional mixing action that ensures a lump free product.

Results

Two pigment blending trials were conducted in the Gansons Nauta™ mixer (10 litres; batch size: 5 kg). In trial 1, red and yellow coloured inorganic pigments were mixed using a ratio of 3:7 to arrive at the desired shade of orange colour.

In the subsequent trial, two red coloured pigments were mixed in 1:1 proportion to obtain a brick-red shade. Inorganic pigments were introduced from the top of the mixer



during the rotation of the screw and arm in clockwise direction at an optimum rpm. Samples were collected from each trial at 5, 10, 12 and 15 minutes to ascertain the time-based development of the desired shades. A pictographic representation of the final product colour for both the mixing trials is depicted in Figures 2 and 3.

Figure 1: Gansons Nauta™ mixer (Side view)



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Figure 2: Trial 1: (a) Pigment 1 (b) Pigment 2 (c) Final Pigment



(a)

(b)

(c)



Figure 3: Trial 2: (a) Pigment 1 (b) Pigment 2 (c) Final Pigment



(a)

(b)

(c)

In both trials, the colour was developed within 15 minutes without the presence of aggregates or lumps. In Gansons Nauta™ mixers, rotation of the screw leads to the generation of convective currents which transport the pigments from the bottom of the mixer to the surface and again the materials are transported by gravitational force on the opposite side of the screw and at the base of the mixer. A definite clearance between the screw and the conical walls (<10 mm) and the absence of dead zones at the discharge port ensure uniform pigment mixing with absence of agglomerates. The final products from both trials were subjected to drawdown test which reinforced the above results and confirmed that the desired shades had been achieved.

Highlights

- Reduction in process time by 75% compared to the ribbon blender
- Decrease in power consumption by 50% compared to the former process
- Absence of aggregates/lumps in the final product

Conclusion

The Gansons Nauta™ mixers were found to be suitable for mixing of inorganic pigments for the cement industry owing to their gentle mixing action, distinct mixing currents, low power consumption and high mixing efficiency. Hence, these mixers hold potential for pigment mixing in the cement and other dyestuff industries.

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