



Effect of additives on color troubles

Overview

It is well known that paint systems consisting of multiple pigments differing in particle size, density and degree of flocculation are liable to suffer from color troubles such as flooding or floating that occurs in the films applied by spraying and flow (dip) coating.

In order to avoid these color troubles, the use of an anti-flooding/floating agent is generally recommended. An anti-flooding/floating agent is a combination of a pigment dispersant and a surface control agent.

This paper discusses the mechanism how to eliminate these color troubles in paint containing two different types of pigments.

1. Introduction

Pink paint consisting of white paint and red paint tends to suffer from color troubles such as flooding and floating when the coating is applied by spraying or flow (dip) coating. Use of a pigment dispersant would prevent flooding, but would not stop floating. A surface-control agent would be effective only in preventing floating.

However an anti-flooding/floating agent which functions as a dispersant and a surface-control agent at the same time would prevent both flooding and floating.

2. Examples

2-1. Prevention of flooding and floating.

Effectiveness of the anti-flooding/floating agent can be observed in photo No.1.

The sample with no additives shows both flooding and floating (panel A).

In the formula containing dispersant Disparlon 2150, flooding has disappeared, but floating (silking) is present (panel B).

In the formula with a surface control agent silicone, floating has disappeared, but flooding is present (panel C).

Anti-flooding/floating agent Disparlon 2200, a combination of dispersant and silicone, has prevented both flooding and floating (panel D).

Photo No.1. Prevention of flooding and floating



panel (A)

panel (B)

panel (C)

panel (D)

2150

silicon

2200

Controlled

(Dispersant)

(Surface control agent)

(Anti-flooding/floating agent)

2-2. Prevention of Benard Cells.

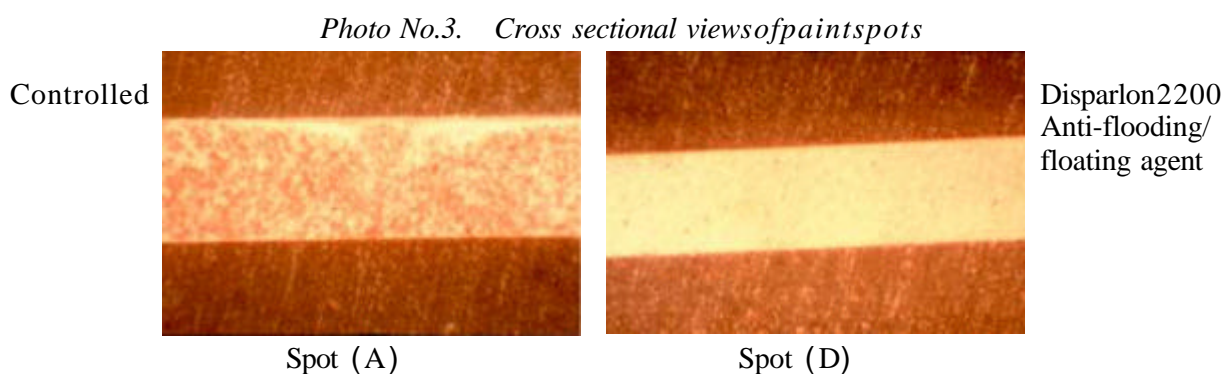
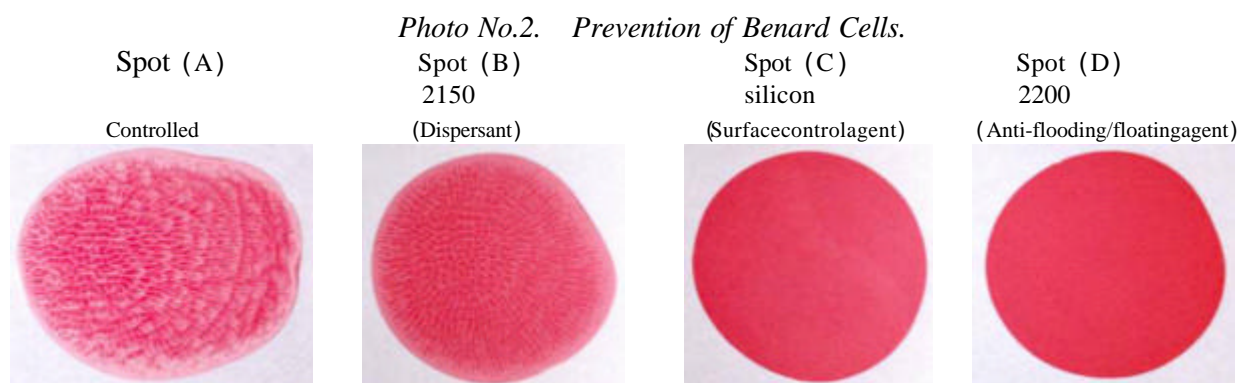
Influence of the additives on Benard Cells formation is illustrated in photo No.2.

While the formula without any additives (spot A) and that with Dispersant Disparlon 2150 (spot B) allowed the appearance of Benard Cells, use of silicone (spot C) and anti-flooding/floating agent Disparlon 2200 (spot D) effectively prevented Benard Cells from appearing.

Crosssectional views of the paint spots under a microscope are given in photo No.3.

When observed carefully, spot A showed circulatory or vortex flows in the film while it was wet as well as some flocculation of red pigment.

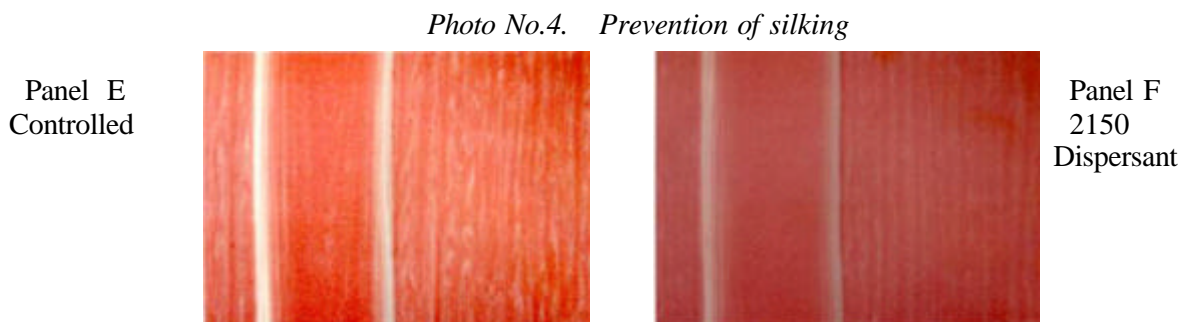
On the other hand, the anti-flooding/floating agent prevented the occurrence of such circulation currents and also contributed to the improved pigment dispersion (spot D).



2-3. Prevention of Silking.

The effect of some products on silking is shown in photo No.4 (E, F, G, H).

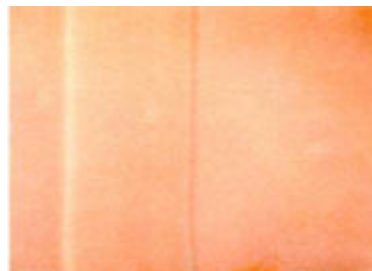
As was the case with the Benard Cells experiment, no difference was seen between the no-additives formula (panel E) and the formula with Disparlon 2150 (panel F) in terms of silking. However, the use of silicone (panel G) and Disparlon 2200 (panel H) effectively prevented silking.



Panel G
silicone
Surface control
agent



Panel H
2200
Anti-flooding/
floating agent



3. Conclusion

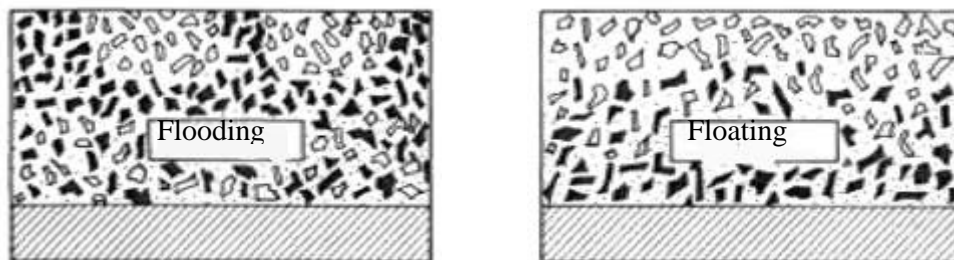
The word “ color troubles ” is a general term referring to various phenomenon that can occur in applied films, among which flooding and floating are predominant. Fig.1. represents the simplified models of these twophenomenon.

Flooding is a term describing the difference in color between the surface of a film and underlying layers. The color density of the surface changes depending on the shear strength given to the paint (during the sprayingordipping process).

The main cause of flooding is insufficient dispersion stability of pigmentsused.

Floating is a termdescribing the unevenness of color observedonthefilmsurfacethathasaspotted or molted appearance. The main causeofthisunevennessofcoloris separation of different pigments that can occur during solvent evaporation, which leads to the formation of Benard Cells.

Fig.1 Schematic illustrationoftwotypesofpigmentseparationrepresentingcolortroubles



Our anti-flooding/floating agent Disparlon 2200 consists of a pigment dispersant Disparlon 2150 based on an aliphatic polycarboxylic acid and a specially prepared silicone that works as a surface control agent.

Relations between an anti-flooding/floating agent anddifferent color troubles are shown inFig.2.

1. A dispersant can prevent flooding by stabilizing pigment dispersion through modification of the electrical charge of pigments but does not work to prevent floating.
2. A surface control agent can prevent floating by checking Benard Cell formation, but does not work to prevent flooding.
3. An anti-flooding/floating agent functioning both as a dispersant and as a surface control agent can prevent both flooding and floating.

Fig.2 Color troubles and anti-flooding/floating agent

