Characterization of the Wet-laid Nonwovens made from Speciality Fibers (I)
- Effect of Production Condition on Fiber Uniformity -

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INTRODUCTION

A primary aim of the nonwovens industry has manufactured a web with maximal cover factor for a given areal density of raw material. This equates with the ideal of perfectly opened and dispersed fibers together with lateral and longitudinal uniformity of fiber distribution. Image analysis techniques already have been applied to carpet quality evaluation, wool fiber scale measurement and fiber behavior in thermally bonded nonwovens(1-5).

Accordingly, we have investigated the relationship between production parameter such as pressure, fiber length and fiber type, and fiber uniformity of wet-laid nonwovens by using an image analyzer

EXPERIMENTAL

An wet web-making machine for this study is newly designed. The sample used are Oxipan®, carbon and glass fibers and binder is polyester fiber.

These fibers cut into fiber length 0.5, 0.75, 1.0 and 1.5cm, and binder fiber is cut into fiber length 0.5cm by cutting machine. The chopped fibers are dispersed in aqueous solution by a agitator and the web is formed on a screen in wet web-making machine. The fiber content is 30, 50, 70% of nonwovens by weight. The web is layered every 72° and bonded under pressure 50kgf/cm^2 with Labo press during 60sec. To determine optimum bonding condition, pretested under pressure 10, 30, 50kgf/cm^2 and time 30, 45, 60sec for the Oxipan® fiber web. The fiber uniformity is evaluated by measuring luminance for the area(1.5mm^2) of wet-laid nonwovens every 30° (Fig. 1). An Image analyzer(MW-200B1, SAMSUNG) is used to investigate fiber uniformity.

RESULTS AND DISCUSSION

The fiber uniformity of wet-laid nonwovens is related to the light level(luminance). For the different pressure of Oxipan® nonwovens, polar diagram is shown in Fig. 2.

The fiber uniformity was better increasing with pressure and time delay.

The effect of fiber length on the fiber uniformity of Oxipan® nonwovens was shown similar trend with increasing fiber length. Especially, the 1cm of fiber length was better uniformity. The fiber uniformity of carbon and glass nonwovens was better appeared at fiber length 0.75cm and 0.5cm, respectively. From this fact, It can be concluded that the defective fibers of nonwovens with short fiber length were less presented than that of nonwovens with long fiber length.

The fiber uniformity of Oxipan® nonwovens was shown similar trend other with increasing fiber content, but, at fiber content 70% was not better than different fiber content. The fiber uniformity of carbon and glass nonwovens was better appeared over fiber content 50%.

Effect of fiber type on the fiber uniformity of wet-laid nonwovens was shown that generally Oxipan® nonwovens was better appeared than carbon and glass nonwovens. This is due to the fact that fiber dispersion Oxipan® fiber was better than those of carbon and glass fibers.

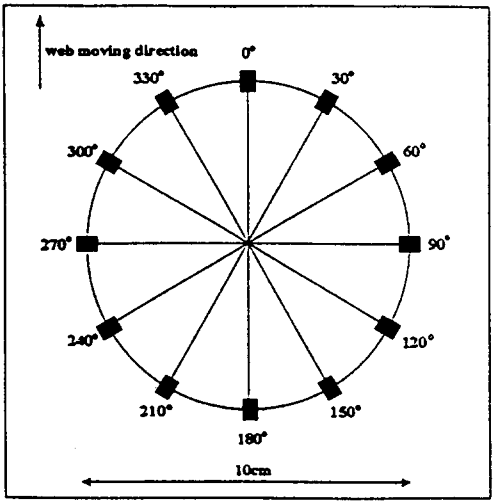

Fig. 1. Schematic diagram of image analysis parts.

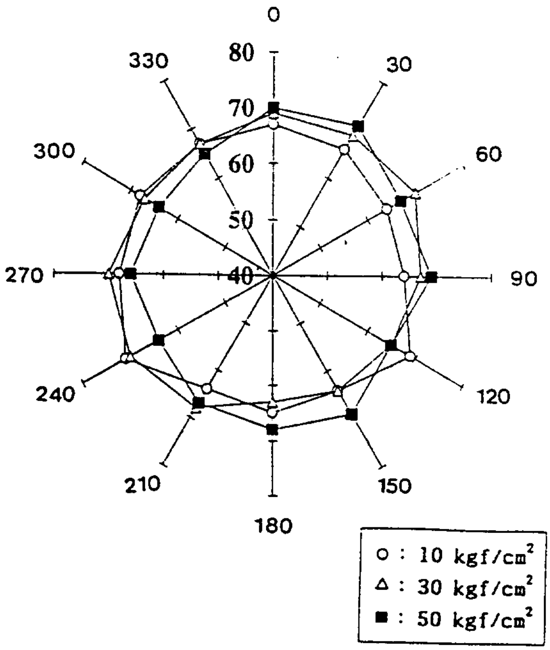

Fig. 2. Polar diagram of Oxipan® nonwovens with different pressure.(time: 60sec, fiber length: 1cm, fiber content: 30%)

CONCLUSION

(1) The fiber uniformity of Oxipan® nonwovens is better increasing pressure and time delay. (2) The fiber uniformity of Oxipan® nonwovens is shown similar trend with increasing fiber length. Especially, the 1cm of fiber length is better uniformity. The carbon and glass nonwovens are better appeared at fiber length 0.75cm and 0.5cm, respectively. (3) The fiber uniformity of Oxipan® nonwovens is shown similar trend other with increasing fiber content. The carbon and glass nonwovens are better appeared over fiber content 50%. (4) The fiber uniformity of wet-laid nonwovens shows that Oxipan® nonwovens is better appeared than carbon and glass nonwovens due to good fiber dispersion.

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