

THE ROTOGRAVURE PRINTING SYSTEMS: PROBLEMS AND TROUBLESHOOTING

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SUMMARY

The most important printing machinery in the ceramic industry is the roto-gravure system which consists of an engraved silicon cylinder with a steel blade to print the tiles. Digital printing is going to be a main system for printing the tiles and all major companies are going to have at least one digital printer in their companies, but why still the roto-gravure system?

There are so many advantages provided by roto-gravure equipment, which persuade companies to use this machine for printing the tiles. It is cost effective, with a long life cycle, and operation, production and maintenance is also simple.

In this article, the defects that are caused by roto-gravure and the way to solve the problems will be discussed.

1. INTRODUCTION

The rotogravure system is a machine for decorating ceramic tiles that uses the so called hollow-graphic technology: several cavities, containing the colour are created with a Laser machine, engraving Silicone cylinders. The Engraving on the surface of the cylinder occurs thanks to a Laser station, able to work with the different pixel systems. The ink outside the cylinder is loaded inside the hole by means of a blade that simultaneously removes the surplus ink before it touches the tile: in this way, only the necessary ink contained inside the holes is transferred onto the surface of the piece to be printed.

2. TROUBLESHOOTING

The main printing problems can divided in these sections.

- A. Loss of precision in tile design and low printing quality
- B. Colour shades between the tiles during productions
- C. The loss of design in the printing area, and any line-form printing defect.

2.1. Loss of precision in tile design and low printing quality

1. Variation in conveyor belt tension, caused by belt thermal expansion as the temperature increases during production (control temperature of the equipment and environment temperature)
2. The belt can display side shifting in the travelling direction, depending on the weight applied to it; large-sized tiles tend to have greater synchronization discrepancies.
3. The use of tile-shifter devices in order to use the whole width of the engraved roller causes the application of various stresses onto the belt conveyor and resulting possible lack of synchronism.
4. The O-ring size for the coupling between the cylinder and support to reduce potential problems of vibration during printing.
5. In the centred mode or synchronized mode, a precision setting must be performed for the right engraved positions.
6. The difference between the speed of the rotogravure belt conveyor and the motor.
7. The setting of minimum distance between the tiles in a line by controlling the line speed (Number of pieces per minutes). Frequent cases of tiles not fully decorated or colour mismatches due to a fast increase in the cylinder rotating may take place.

8. Any pollution on the belt can cause increase or decrease the belt speed and also may cause the belt vibrations.
9. With the high belt speed the cylinder rotation is faster and the contact time of the cylinder-surface to be decorated is lower and the charging-discharging operations of the holes are more difficult, the Medium plays a very important role.

2.2. Colour shades between the tiles during productions

1. Colour shades because of differences in the viscosity of the paste during production.
 - Change in viscosity because of pollution in the paste or increasing temperature of the paste because of paste mixer equipment. By using instruments equipped with a paste container, and a high precision balance and paste circulation system to control the consumption and amount of the paste which will be applied to the surface during the production, this problem will be solved.
 - Change in viscosity because of water evaporation.
2. Shades because of colour mixing in the different heads. It is recommended to increase the distance between each printing head or use glue spray before printing.
3. Shade between the tiles coming behind. The rheological features of an ink are affected not only by the medium used but also by the raw materials present in the solid part: such as raw materials contained in the printing bases (frits, kaolin, clays) and the pigments used, which play an important role in the rheology of the final compound.

2.3. The loss of design in the printing area, and any line-form printing defect.

1. No printing in some sections of the tile, because of an impact on the cylinder by hand or tile, which may cause concavity in some area of the cylinder surface.
2. Loss of printing in some area of the tile because of the kind of paste and engraved depth and mode. In some case, in which the engraving is too deep, the paste discharge on the surface of the tile does not drain well. Also if the viscosity of the paste is too high, possibly caused by increased temperature or circulation time, this may caused print loss or dirty printing on the tile.
3. Dirty printing because of changes in viscosity of the paste. It is recommended to use fixative applied with a spray instrument before printing to reduce this kind of defect.

4. Loss of printing because of the machinery setting. If the machine is not set correctly in the standard plate mode, the distance between the tile and cylinder is not the same in all the printing area and differences in printing quality and in some case print loss may occur. It is recommended to set up again and control the cylinder height by standard plate
5. Loss of printing at the tile edge because the density of the glaze is too high. By using glaze with a lower density, the problem can be solved.