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AUTOMATIC ADAPTIVE COLORANT SELECTION FOR BLANKET CLEANING

HP INC

Automatic Adaptive colorant selection for Blanket Cleaning

Abstract

In a liquid based ink printing process, the low ink consumption, such as in continuous low coverage printing or complete inactivity of the ink, is limiting fresh ink flow to the ink tank. As a result, the same ink solution from the tank is used multiple times and stays in the tank for a long time. That may cause to damage of the ink particles and contamination accumulation in the ink tank, which leads to Print Quality (PQ) deterioration such as optical density drops, white spots, etc.

Described technic provides an automatic and adaptive method to increase the refreshment of the ink suspension while printing - enabling a continuous printing process and minimizing "old ink" phenomena (like fatigue) without wasting ink solution and stopping production at the customer site.

Introduction

In a liquid based ink printing process ink is delivered to customers in a more viscose state than working solution. That is done to reduce shipping costs. Intermediate ink tank is used for dilution of the ink and in some cases to add additives to get the working solution. Typically, the %NVS (non-volatile solids) in the cans or tubes shipped is between 23% and 35%, while the working solution requires 2-3% NVS to support printing. Intermediate tank is also used as a buffer of ink to enable continuous printing. Fresh ink is added to that tank based on its consumption that has a direct connection to ink coverage on the printed page.

The amount of ink solids (inside the intermediate tank) is controlled by an optical density sensor. When the ink is being consumed from the tank the sensor notifies the press to add solids from the tube/can. Together with ink solids, a liquid carrier and other additives are added to the tanks as well (conductive and/or recycling agent for example).

From the ink tank, ink is delivered to the Ink Developer which further develops the ink and forms a solid uniform layer of ink on the developer roller surface prior transferring to the Photo Conductor. Ink which is not transferred to the Photo Conductor (background and non-image areas) makes its way back to the ink tank.

Electrical fatigue problems appear in all colors while with Cyan being the most severe. It occurs when the customer prints jobs with low coverage, resulting in abrupt optical density decline and significant background increase. That is due to the rise in ink particle conductivity when the ink is exposed (continuously) to a high electric field until the top of the Developer voltage working window.

Another issue which occurs when the working solution is not refreshed frequently (as a result of low coverage printing or total inactivity) is contamination of particles (ink, liquid carrier or other additives) - and as a result lead to print quality deterioration and defects, such as white spots or dot gain.

Currently the only existing way to overcome that problems is to refresh (partially or fully) the ink solution in the intermediate tank. As a result of the refreshment a significant amount of the ink is wasted, and production time lost.

Description

Blanket (intermediate transfer member) cleaning is required to provide continuous printing - avoid background accumulation, memories (ghost), paper size marks visibility and reduce stickiness. Typically, a blanket cleaning process is required once in a ~1,000 impressions but subject to media properties (a matte substrate requires cleaning each ~400 impressions while coated glossy substrate requires each ~1,200). Blanket cleaning is performed by printing a few spreads of solids (100% coverage), preferably on a coated gloss paper (to assure optimal transfer of ink to the media).

Blanket cleaning is typically performed with a single colorant (for example: yellow) or two colorants, 1 for each half in case of double image (for example: yellow and magenta). The cleaning ability of each colorant is typically the same, and the selection of those specific, in many cases, are random.

Our proposal is to utilizes blanket cleaning as an ink refreshment mechanism. Since blanket cleaning requires 100% coverage printing - we select the colorant and the desired cleaning frequency according to which ink we want to refresh.

The press tracks and computes the average coverage of the last selected period (for example, a moving average of the last 1,000 impressions is computed, for each color). When blanket cleaning is required, the colorant selected will be the one with the lowest coverage. In some cases, when the average coverage is lower than a selected value, we might increase the cleaning frequency or a number of cleaning spreads - but since cleaning consumes customer's media, those are performed only in extreme cases. The invention is described well in the flowchart below in Figure 1.

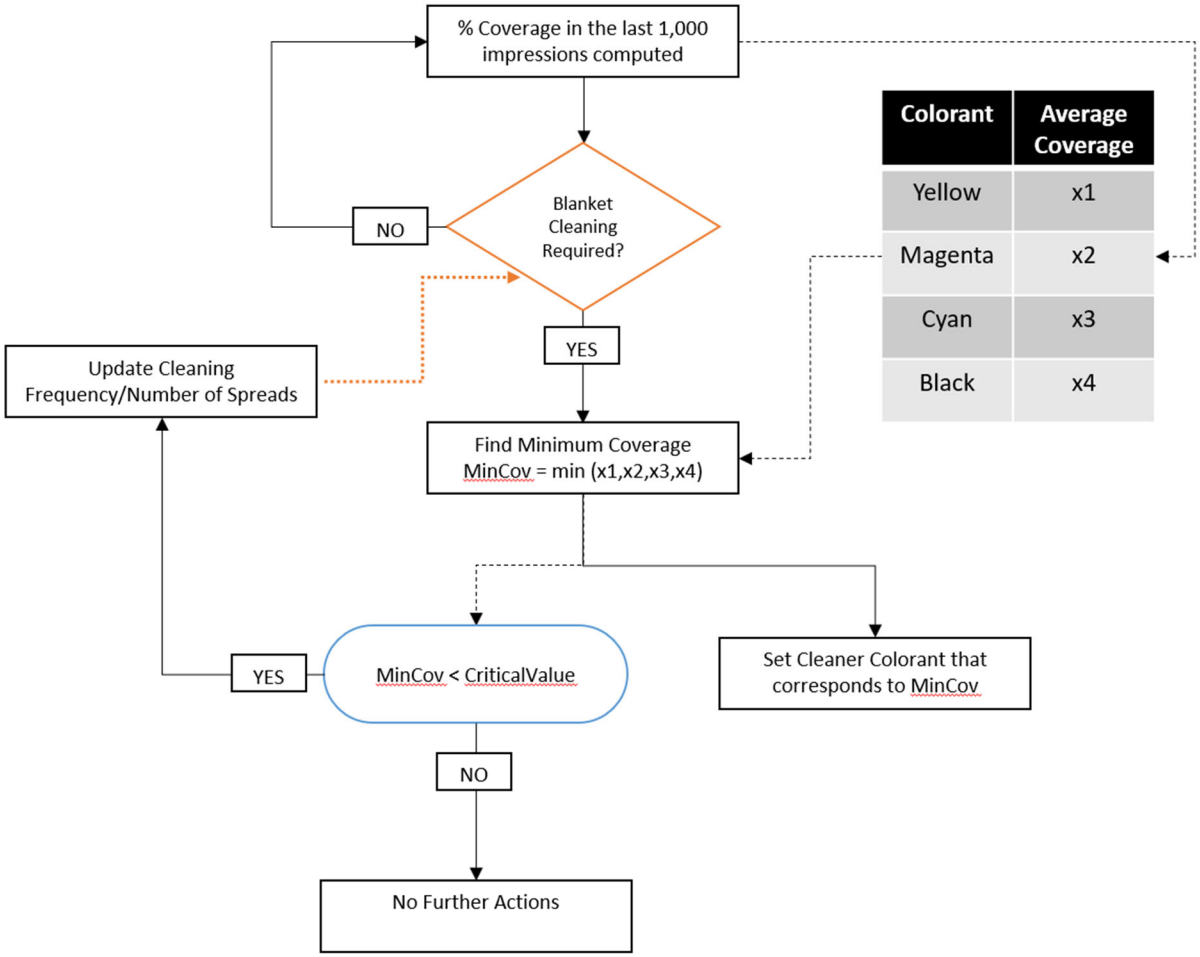

Fig 1. - Flowchart of the proposed invention

The consumption is increased significantly when the proposed invention is applied - resulting in a significantly higher refresh rate prior to the invention, as can be seen in Fig. 2.

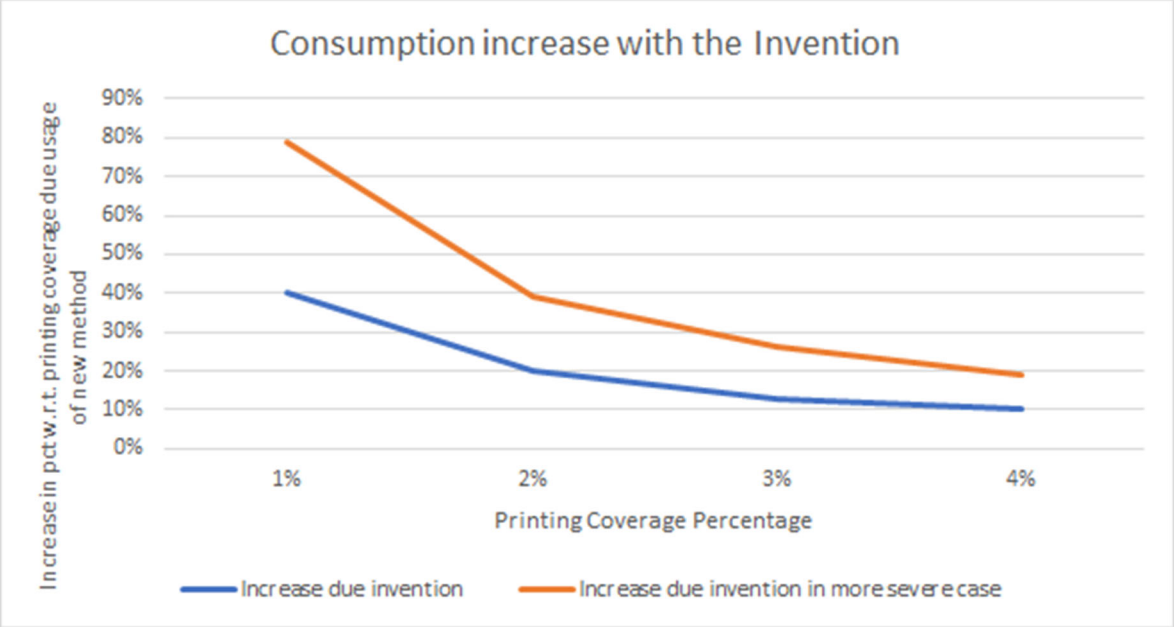

Fig .2 - Consumption increase rate when the invention is activated on the press for various low coverage levels.

Such technic avoids ink wasting (due to the frequent refreshments when printing low coverage) by smart utilization of existing press procedures (blanket cleaning). In addition, all that is done automatically and in an adaptive way, without operator intervention.

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