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WIPER HEIGHT ADJUSTMENT AUTOMATIC CHECK

HP INC

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1. INTRODUCTION

During the printing of a 2D plot or 3D part it is of utmost importance to keep the nozzles of the printheads as clean as possible. One of the techniques used to clean the printheads while printing is by means of the use of a web wipe. A web wipe consists of a mechanism holding a cleaning roll of cloth that is pressed against the printheads by a rubber blade while the carriage is passing on along. The wiper is able to move up (engage) and down (disengage) the rubber blade so as to wipe or not wipe the printheads as the carriage passes on. After a wipe, the cleaning roll is advanced in order to have clean cloth on top of the rubber blade prepared for the next wiping. To perform a proper wiping and cleaning of the printheads, the wiper engage height must be previously calibrated so that the rubber blade is having the required interference against the printhead to ensure the proper wiping pressure of the cloth on the nozzle plate. Ensuring the wiper engage height is correct while printing is critical to ensure the best performance of the printheads and the quality of the printed image or part.

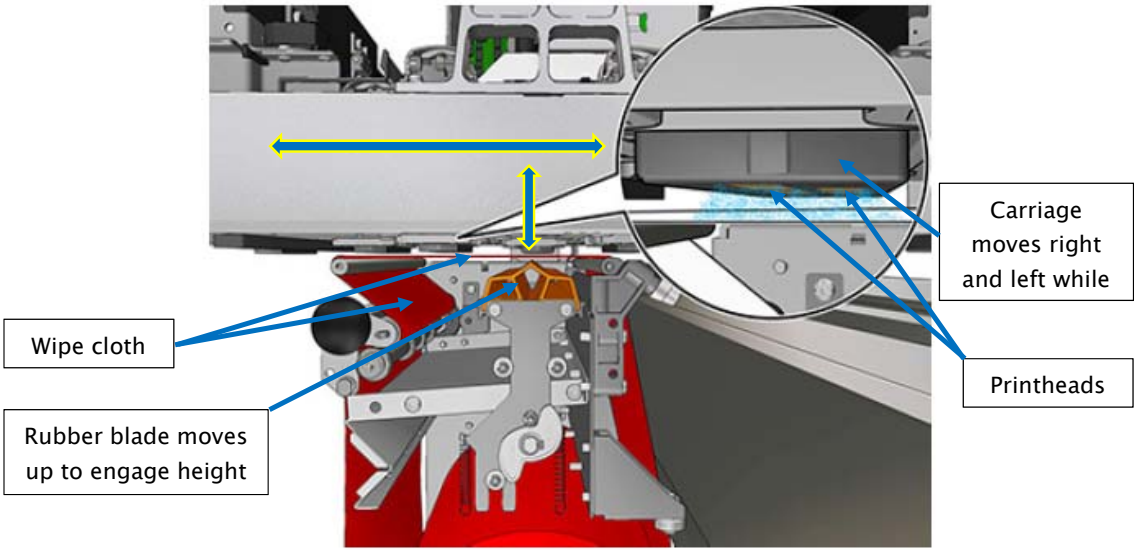

Figure 1: View of wiper and carriage

The proposed invention of this disclosure is to perform an automatic check of the wiper engage height, right before or while printing, by monitoring the voltage pulse width modulation (hereafter PWM) applied to the engage motor. The wiper engage motor is driven by a servo loop that applies the required PWM to reach the required height (normally sensed by an encoder disc and sensor) of the blade. Normally, in order to keep the wiper blade static at the engage height, a constant PWM is required to be applied to counteract the engage mechanism. Due to the interference between the printheads and the rubber blade, when the carriage passes on, the servo must transiently increase the PWM applied to the motor to balance the additional forces. This additional PWM applied correlates with the pressure and interference of the rubber blade on the printheads. By monitoring these transients of voltage PWM during the wiping, it can be ensured that the wiper engage height is correct.

Printing while the wiper engage height is not properly adjusted may result in major problems. If the engage height is too low the defective pressure of the rubber blade and cloth will not properly clean the printheads that may result in nozzles clogged and subsequent image or part quality issues. If the engage height is too high the excessive pressure may damage the nozzles that may also affect the quality of the plot. By automatically checking the wiper engage position right before or while printing such problems are solved.

2. METHOD AND RESULTS

The following Picture 2 shows a graph of the wiper engage motor PWM and height. The wiper rubber blade is engaged at height 14000 [motor encoder units]. Initially the servo loop is applying a constant permanent PWM to the engage motor to keep the blade at the engage height. When the carriage passes wiping the printheads a transient occurs: the servo loop increases the PWM in order to counteract the additional forces and keep the same height. When the carriage goes away the servo loop decreases the PWM back to a permanent constant value.

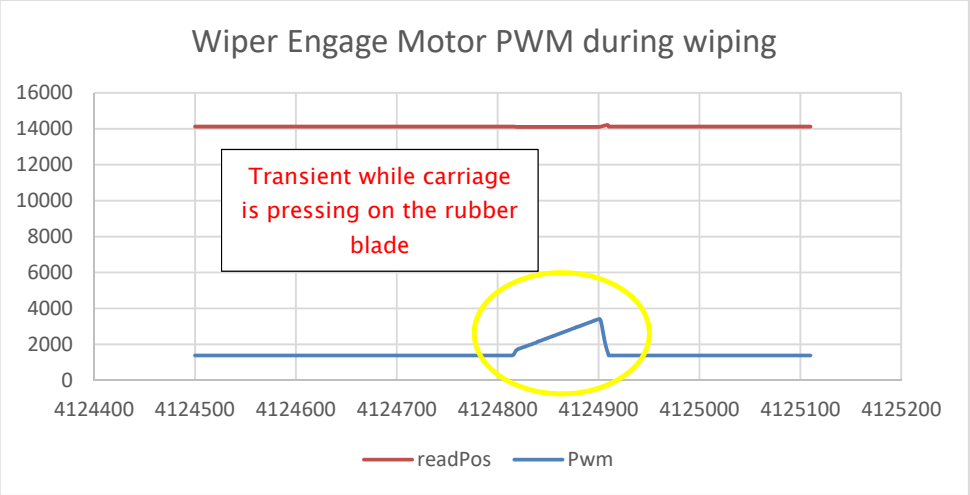

Figure 2: Wiper Engage Motor PWM and Height

When the interference between the rubber blade and the carriage is as expected the exciding PWM during the transient should be within some defined maximum and minimum limits: If the PWM required is higher than the maximum limits the wiper engage height is too high; contrarily the wiper engage height is too low. Either a peak or an integral analysis of this transient may be appropriate to determine whether the height is correct or not.

The following Picture 3 shows a graph of the wiper engage motor PWM and height while printing. The wiper is alternatively engaged and disengaged while the carriage is moving right and left to print. The graph shows the transients while the carriage is wiping the printheads.

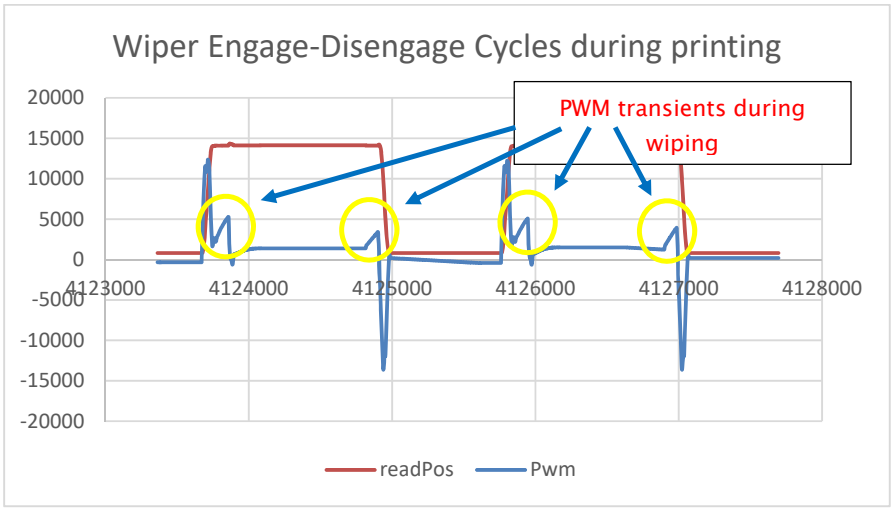

Figure 3: Wiper Engage Motor PWM and Height

A preferred implementation for this invention is as follows:

- During the initial checks before print, the printer would carry out a wiping by engaging the wiper rubber blade and moving the carriage passing on along.
- The PWM transient would then be evaluated to determine whether it is or not within the expected limits. If within the limits the check would show a "PASS" in the front panel of the printer to inform the user or operator that the wiper is performing as expected. Contrarily, if the transient is out of the expected limits the check would show a "FAIL", preventing the unit to print, and requesting to adjust the wiper engage height by following the calibration procedure.

3. CONCLUSSIONS

- By automatically checking the wiper engage height right before or during printing, image quality issues due to incorrect cleaning of the printheads are prevented. In the case of a 3D print, this would avoid losing a complete build which is very cost and time expensive.
- Additionally, this check is a confirmation that the calibration of the wiper engage height is providing not only the expected interference, but also the expected wiping pressure against the printheads.

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