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PRINT MODE SWAP DUE TO ELECTRICAL FEEDING CONDITIONS

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Print mode swap due to electrical feeding conditions

Overview of the system

In 3D printing systems, different print modes can be selected with different layer time, and depending on this print mode selected, the parts could have different properties because depending a specific print modes, a high amount of energy is needed to fulfill print modes requirements, and sometimes, electrical feeding system is not enough depending on external conditions.

In this article, we want to explain a system that can swap on the fly between different print modes depending on electrical grid adopting the best solution for the user.

Which are the problems that this system solves?

The presented solution solves following problems:

- Avoid of losing jobs due to fluctuations in electrical grid connection
- Expand the use of the 3D printers to locations with “bad” electrical connections
- Finishing jobs extending job time that in other conditions will have impact in part quality of the parts.
- Continuous use of the printer, isolating from electrical conditions. Normally, depending of the industries that are closer to printer location, they can down the voltage of the grid.
- Extend printing working temperatures, because if the ambient temperature is too low, a higher energy can be needed, and it will be solved with this solution, extending print job time.

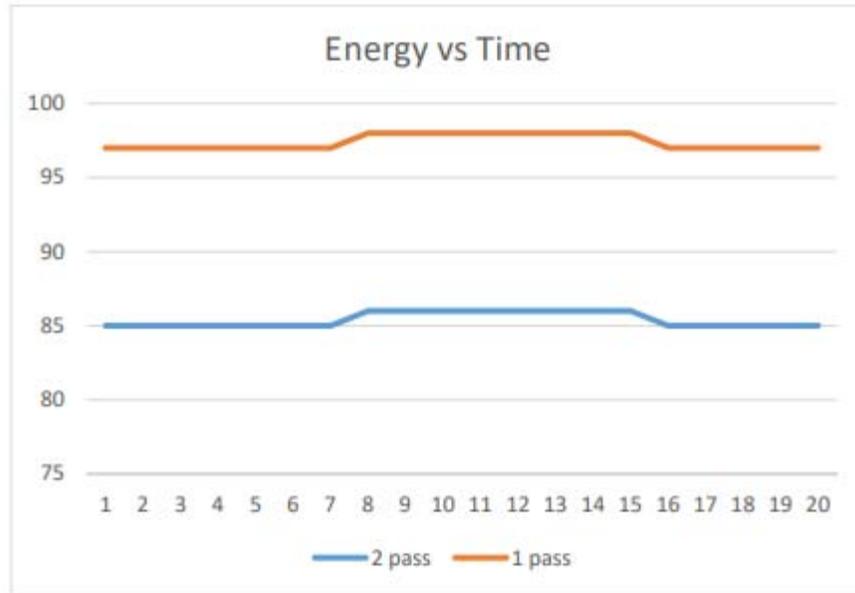
How does the systems work?

In some 3D printers there exist different print modes for improving different factors. Some of them can be part quality, look and feel, mechanical properties and job time. We will be focused in this last parameter, job time.

Exist “1 pass print mode” that decrease a lot the printing time for a job. Instead of doing 2 fusing cycles, only 1 fusing cycle is used. For doing that, more energy is needed to be used in 1 pass.

For explaining a bit better, we will use some “example” data. We can imagine that the energy that our grid connection can supply to us is 100%. It will depend in the nominal voltage that our grid connection is available. Imagine that at 240V line to neutral (or line to line) is available, the energy we can obtain is higher than 190V Line to neutral (or line to line). This nominal voltage

is not continuously the same all the time. It can have some fluctuations, sometimes a variation of 10%. When we are using 2 pass mode around 240 VAC , probably we will need some energy close to (example) 85% of the total energy available, but when we are using 1 pass mode, we will need probably an energy level of around 95% or 96%. In this situation, we have a margin of about 4% to 5% for grid voltage variations.

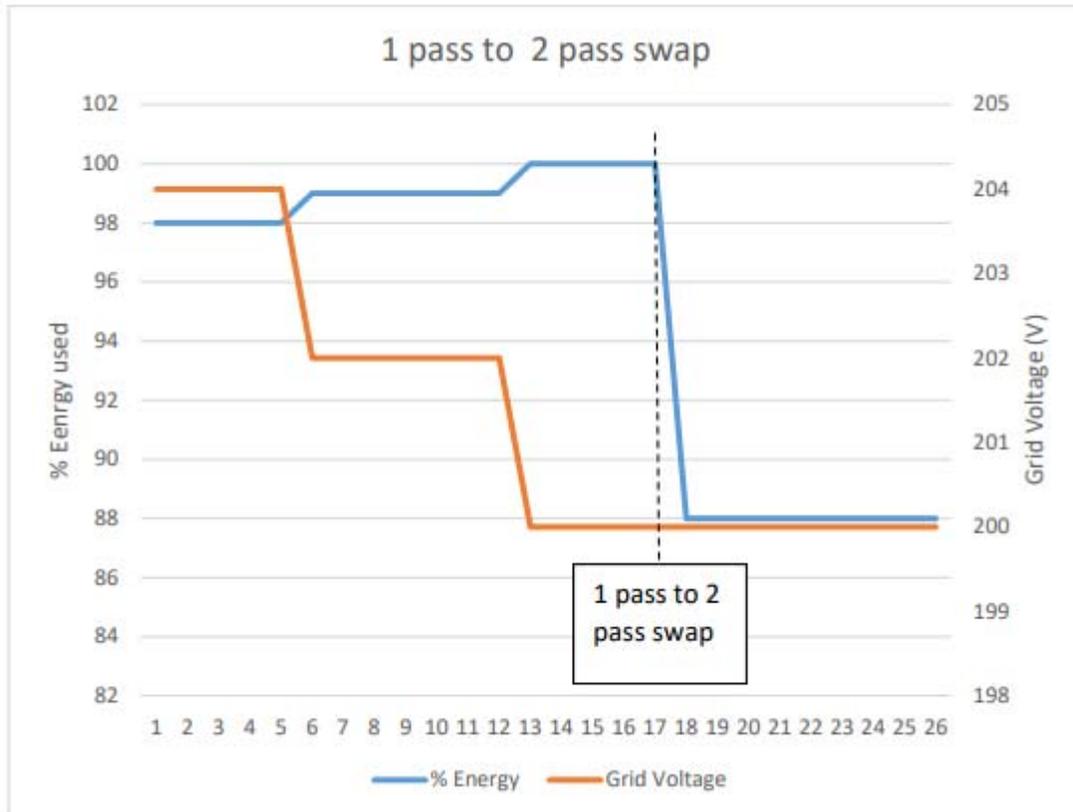


When the connection instead of 240VAC is around 200VAC, these energy values will be higher, and the margin will be smaller. Let’s place an example.

At 200VAC, the percentage of energy needed can be close to 87% or 88%, with enough margin for dealing with grid voltage variations, but when we go to a 1 pass mode, the energy needed can be close to 99%, and any variation of the grid can make that energy needed for 1 pass mode will not be enough for a good 1 pass mode.

Currently, the selection of the print mode is done at the beginning of the job, and it can not be changed until a new job is sent.

With our proposal, we will use a device that will be monitoring the grid voltage value, and it will send the information to the system, that can decide to change the print mode on the fly depending on the tendency of the grid, going from 1 pass mode to 2 pass mode. With that, the job time will be longer that expected at the beginning, but we will be sure that the job will finish with good properties, avoiding classifying it as “bad” job.



Which are the advantages on doing in this way?

- Increment good parts production
- Be independent on the electrical grid conditions when sending the job.
- Save of powder and ink because no trash jobs will be produced because a bad grid connection.
- Customer will have a best customer experience because good job rate will increase
- No additional hardware is needed, because printer already have grid voltage detection.
- Improve production time in customer with low voltages grid, because they can use the 1 pass mode always that the grid allows it.

Are in the market other kind of solutions?

Previous solutions are defined as selecting the print mode at the beginning of the job, but not current solution for doing it on the fly, that gives us the advantage previously mentioned.

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