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STUDY AND DESIGN OF A DEVICE THAT APPLIES ADHESIVE TAPE

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ABSTRACT

This work describes all the development of a mechanical design that have been realized for an industrial semi device, whose functionality is to apply adhesive tape around a cylindrical body with high level of flexibility. With all the study realized it was possible to achieve a 3D virtual prototype with the conceptual idea obtained and to determine the critical key issues of the device. Those points should be analysed during the testing phase using a physical prototype.

Keywords: mechanical design, process, device.

INTRODUCTION

Nowadays, the adhesive tape process is a full manual process executed by company's workers. The adhesive tape function is divided in many auxiliary tasks, like as: the separation of the adhesive tape from its original base paper, it's position around revolution axis of cylindrical body and the pressure applied during this last process. During all this process it is necessary to ensure that adhesive tape is successful and efficiently applied, otherwise the final product will not be accepted by the final customer. This whole process is associated with several specifications related to the adhesive tape as the different number which can be applied, the different positions of them, the different values of adhesive tape's width and the distance between the different exemplars. In terms of specifications design, these are not limited to adhesive tape because the cylindrical body have four different length, the biggest is 122 % bigger than the smallest body, and have two different values of body diameter, with a discrepancy of values around 60 %.

The "French's Model of the design process" (Nigel Cross, 1994) was the design methodology followed, where a need emergence (by an industrial factory) allowed to study, to structure and to develop all mechanical design associated to that necessity. During all study realized, was achieved and developed a lot of solutions for each function and sub function of the project (seventeen in total), and later the final option was selected according to an evaluation made, based on objectives tree which had been built for this project.

The final design idea is the result of the joint of various sub solutions achieved. Considering the final costs of the device, which is one of the baseline present in the objectives tree, the teamwork of this project had taken advantage of operator's presence around the device during all the process delegating some tasks to him, especially during the preparation mode, where the device is prepared to the continuous operation.

RESULTS AND CONCLUSIONS

Thanks to all the work done it was possible to reach a 3D virtual prototype of the equipment which is shown in Fig.1.

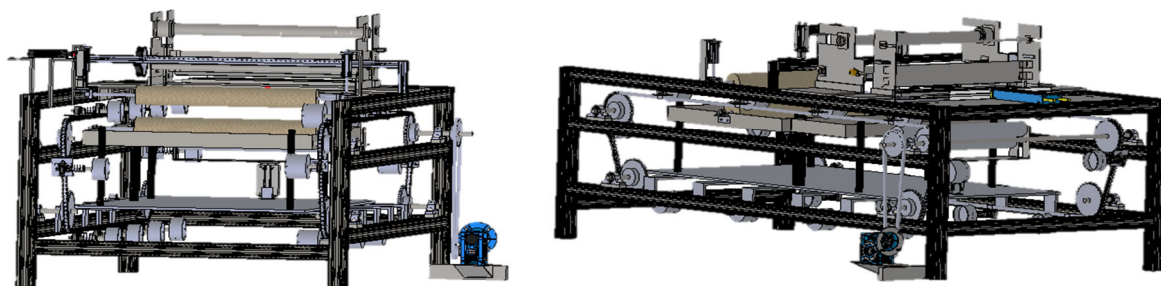


Fig. 1 - Two different device's perspective

The main conclusion of this work is that this project is highly complex, as for as that have some crucial aspects associated to device which theoretical forecast is very difficult, mainly due to the unexpectedness in terms of adhesive tape's behavior and cylindrical body's behavior, mainly due to his high flexibility. Another question has been put over this project that was the stability of conveyor chains, which are responsible for convey the cylindrical bodies along the different work stations present on this device. This stability must be checked in practice, in spite of all the preventive measures taken as the linear guides, which will help to carry the load transported. All this random behavior implies the realization of practical tests, with a physical prototype, to check if all the idealized solutions will perform as intended, without any constraints.

As the device has many different functions, it will be more practical to build different small prototypes, especially one to test all conveyor system and other one to check all adhesive tape applying function. So the next project's stage is very important to check if this design idea obtained is viable or if it is necessary to readjust this initial idea.

After this stage be completed, the project will come to finish the last task of the methodology followed which is the Detailing, where all documentation about this device is defined, especially all working drawings and operating instructions manual.

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