

# THE DESIGN OF SURFACE COPYING MACHINE USING VACUUM FORMING PRINCIPLE

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## ABSTRACT

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Surface copying machine is used to replicate a shape of an old product that is no more in production. Besides, it also can be used to replicate a product for evaluation purposes if only one prototype has been machined. Usually this method is applied on small volume production.

Surface copying machine transform a plastic sheet into the shape of the mould by using vacuum forming principle. This machine can be divided into 3 parts: mechanical, structure, software and electronic circuit part. Software is used to control the whole operation of the machine. The program is written by using VB programming language. Electronic circuits are used to amplify the signal from the parallel port in order to switch on/off the electrical devices.

Before the surface copying process, the machine has to be warmed up first so that during the heating process, the temperature can remain in constant. After one minute warm-up, the plastic sheet will be clamped in between the upper cover and the middle part tightly, as to prevent air leakage. The heating process will be carried out until the plastic sheet is soft enough to transform into the shapes of the mould. After the vacuuming process, the upper cover will be lifted up and the whole process is completed.

From past experiments that we have done, we found that if the mould is cold, the heating time and the vacuuming time have to be set longer, and vice versa. However, if the mould is cold, but the temperature that we set, by using thermostat, is high, the heating time and vacuuming time can be shorten. Besides, the heating time and the temperature that we set also depend on the thickness and the melting point of the plastic sheet. If the plastic sheet is quite thick, it has to be heated longer compared to a thinner one. Not only that, if the plastic sheet has to expand longer, it is necessary to replace the plastic sheet with a thicker one, so that it has more material to be expanded.