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## EFFECT OF PROCESS PARAMETERS ON IMPACT ON COMPOSITES AND COMPRESSION AFTER IMPACT

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### ABSTRACT

The purpose of this article is the question of the possible link between composite processing and impact and post-impact behaviour [1,2,3,4].

A Taguchi method of design of experiments was used to establish possible links between processing parameters and impact and compression after impact behaviour. The processing method studied is liquid resin infusion of stitched or unstitched preforms made of carbon quadri-axial Non-Crimp Fabric (NCF). Five process parameters were selected (stitching, cure temperature, preform position, number of high porous media and vacuum Level). The parameters used are shown in Table 1.

Table 1: parameters used in experimentation.

Plate N°	Plate side	Stitching	Curing temperature (°C)	Number of HPM	Vacuum level (mbars)
1	Vacuum	Without	180	1	1.3
2	Injection	Without	180	1	1.3
3	Vacuum	Without	160	2	1.4
4	Injection	Without	160	2	1.4
5	Vacuum	Yes	180	2	1.6
6	Injection	Yes	180	2	1.6
7	Vacuum	Yes	160	1	1.4
8	Injection	Yes	160	1	1.4
9	Vacuum	Yes	170	2	1.3
10	Injection	Yes	170	2	1.3

Table 1 gives an idea of parameters that have been varied and how, during experimentation (fabrication of plates).

The general equation of a linear model for a property Y takes the form of equation 1.

$$Y = C + a. CO + b. Tc + c. NHMP + d. Cp + e. VL \quad (1)$$

Where

- CO is stitching
- Tc is cure temperature
- NHMP is number of high porous media
- Cp is plate side of composite
- VL is vacuum level

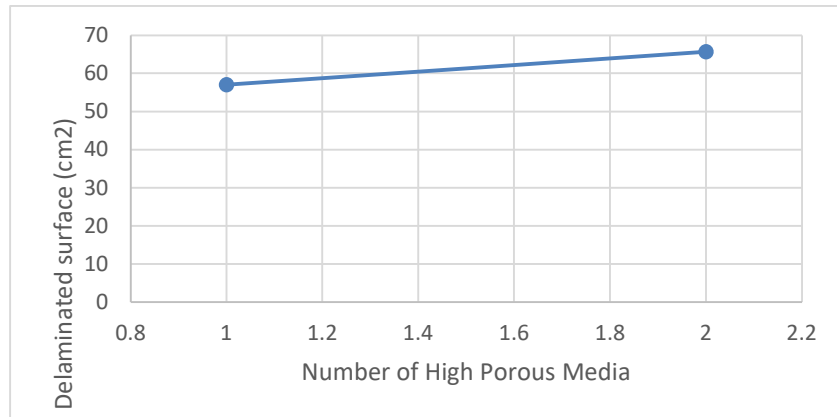


Figure 1: Delaminated surface as function of number of high porous media.

The statistical analysis done showed a very high sensitivity to stitching of many properties what was of course expected.

Stitching was found influent on After impact compression strength, elastic energy, absorbed energy and residual dent depth. Damaged area was found sensitive to number of high porous media (Figure 1)

Residual dent depth was found sensitive to stitching, cure temperature and side of the plate.

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