THE DIGITAL INVESTIGATION ON THE BEHAVIOR OF A COMPOSITE MATERIAL'S STRUCTURE IS REQUESTED BY AN EFFORT TYPE '' SHOCK ''

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Abstract - numerous studies are already made in the field of fast dynamic, which is expressed in our case by solicitation of impact that is still relevant. Various difficulties associated with the solicitation of shock are just added to us in studying the problems of composite materials, including their homogenization or characterization. For this purpose, our present investigation is concerned with the study of the influence of the impact plates in the composite material. For this, calculation software was used and the chosen structure is sandwich plates. The Characterization tests were performed have then allowed to complete the data required for various applications made. The obtained results are

Index Terms - Shock, Sandwich Plate, distortion

I. INTRODUCTION

The shock is a solicitation which may occur in different forms and may have a recognized intensity or not. The effect of shock may range of simple wave propagation in a total collapse of the structure. For their part, composite materials have an economic advantage which is very important, especially in the fields of civil and mechanical engineering that enter as reinforcing materials.

II. COMPOSITE MATERIAL

The composite material subject of our study is experiencing widespread use. Many works in literature affect this area and explain these uses. [10]

III. THE SANDWICH MATERIAL

The sandwiches are materials composed of two different parts. One is called "coating (soles or skins)," the other "heart (or soul) ".The sole is a part of high stiffness and low thickness surrounding the heart, which has a thick and low resistance.

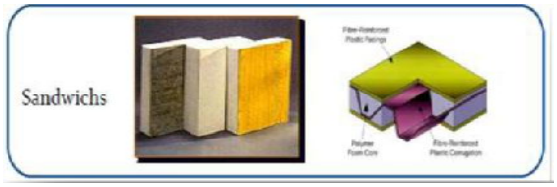


Figure1. Sandwich plate

IV. Generalities on the shock

In general, the mechanical impact is known as the vibrational excitation, whose duration is equal to about half the natural period of the mechanical system. The excitation force of impact is defined as the instantaneous acceleration transmitted to the structure at the point of application or to the contact surface. The system response is expressed in terms of relative displacement at the base of the mass or the absolute acceleration of the mass.

V. THE DEFINITION OF THE IMPACT

In mechanics, the shock is the application of a large force for a short time, usually accompanied by a sudden change in velocity. High energy impacts often result in punch and can to cause serious damage. However, we must not neglect the low energy impacts because they cause delamination (separation) within composites that can propagate under cyclic loading. This is insidious because no external sign warns about damage in the composite structure. In the case of an impact leading to perforation of the composite plate, we can simulate the effect as a cut resulting in a decrease in mechanical strength of approximately 50%. [6, 7, 12]

VI. THE PRESENTATION OF THE MATERIAL USED

The sandwich composite (Figure 1) used is called aluminum composite panel, coatings are made of aluminum with a thickness of 0.5mm and the heart is a 3mm-thick layer of carbon fluorine which form the sandwich panel with a thickness of 4mm:



Figure1. Sandwich Plate

Table 1 illustrates the different mechanical properties of the sandwich plate:

Sandwich plate	X Direction	Y Direction	Z Direction
YOUNG modulus (Gpa)	8.085	1.67	1.67
Shear modolus (GPa)	3.48	1.23	1.23
Poisson Coefficient	0.16	-0.32	-0.32

Tab1.The mechanical characteristics of the sandwich plate And Volume Mass =1110Kg/m3

VII. GEOMETRIC AND BOUNDARY CONDITIONS

In Figure 2 and 3 we can observe the data used in this example to know the geometric characteristics of the material, the impact force applied, and the support conditions. With regard to symmetry, we analyze the quarter of the plate.

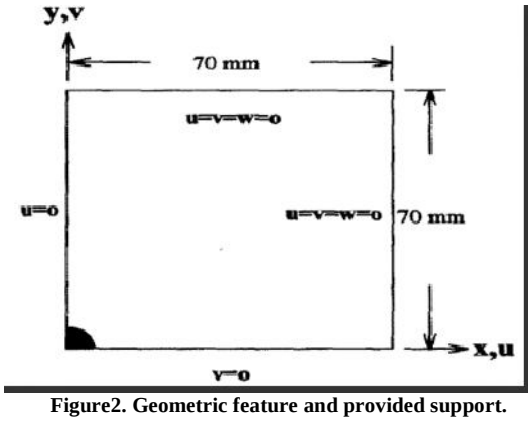


Figure2. Geometric feature and provided support.

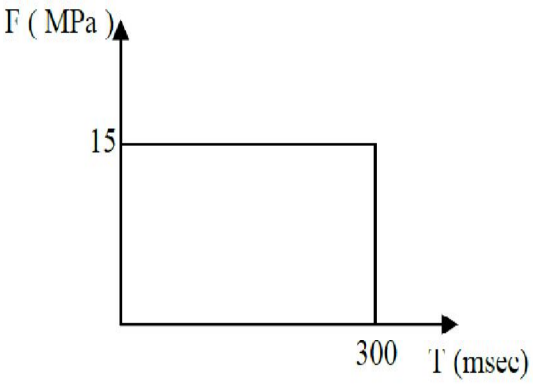


Figure 3.The application load

VIII. RESULTS AND DISCUSSIONS

The data have been incorporated into a local developed software the results obtained are illustrated in Figure 4. We pushed the study even further by varying load intensity and thickness. For the variation of the intensity of the load, the curve shape remains the same although the first pic has increased with the intensity of the load; see figure 5 below

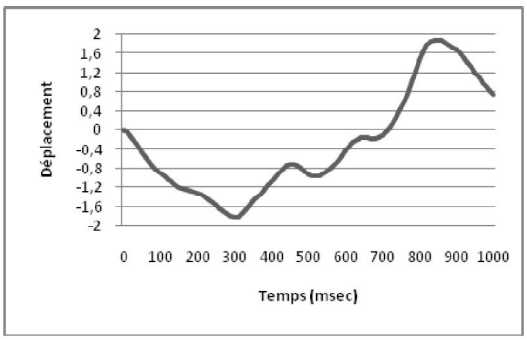


Figure4. Graph of displacement in the interval [0.1000] msec

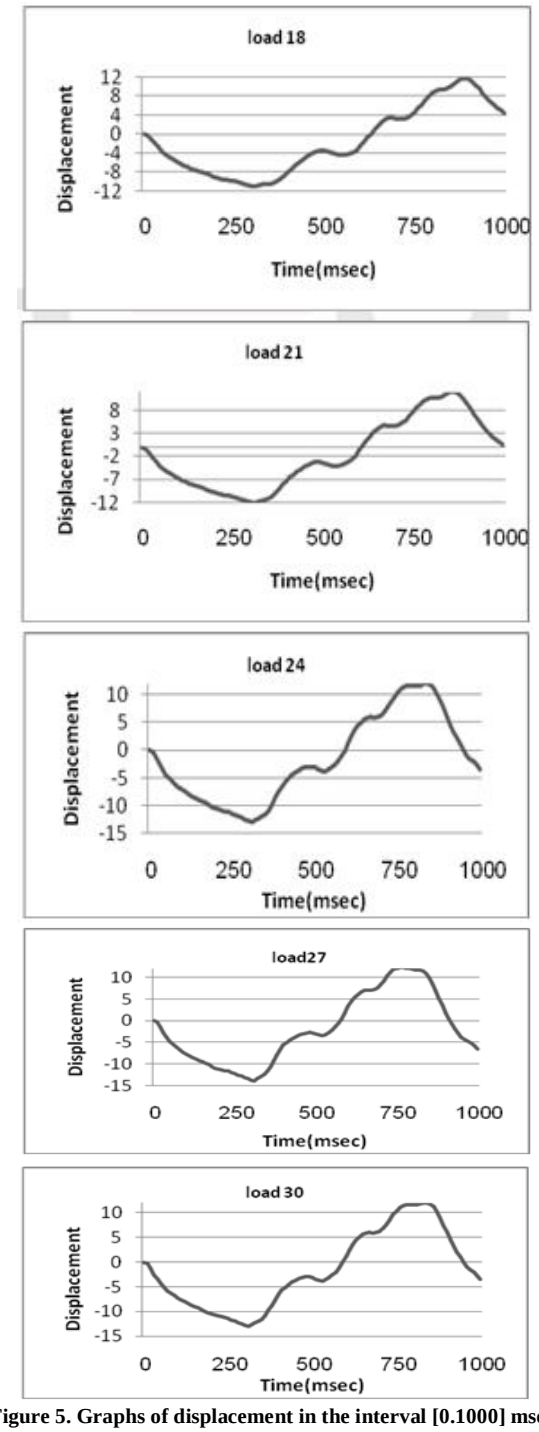


Figure 5. Graphs of displacement in the interval [0.1000] msec (change in load intensity)

To study the influence of the variation of the thickness on the response of the sandwich plate vis-à-vis load, we increased the thickness of the heart that is usually made of less expensive material than the coating, and the results obtained are illustrated in graphs (see Figures 5 and 6). Variation in thickness resulted in a decrease in maximum amplitude, and residual displacement, and a non-instantaneous return after the end of application of the load.

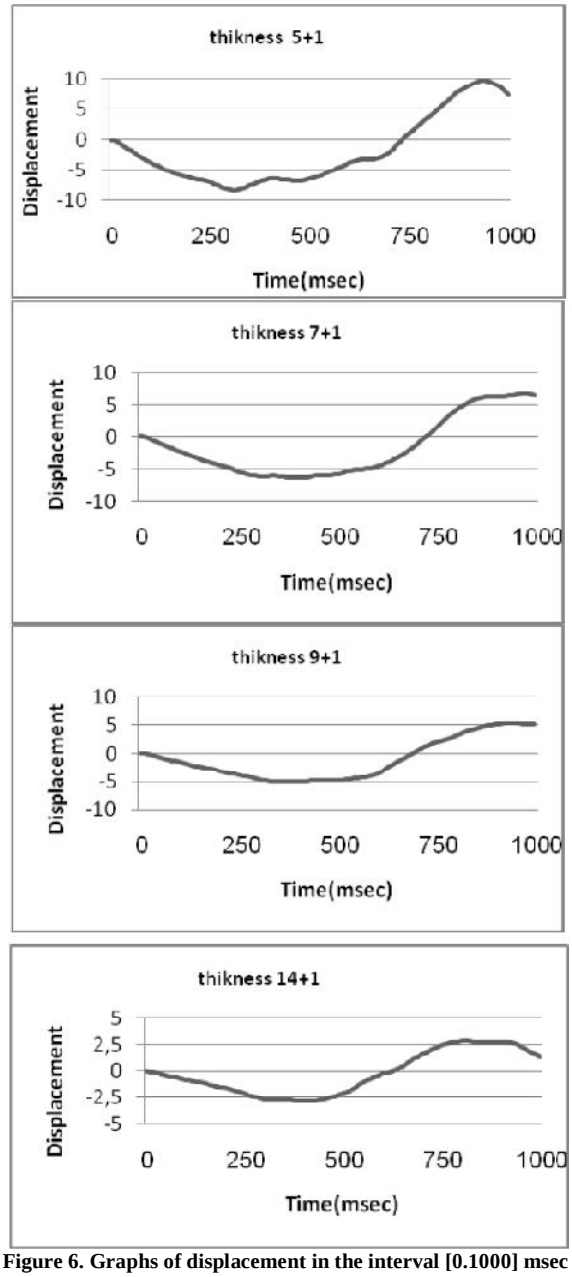
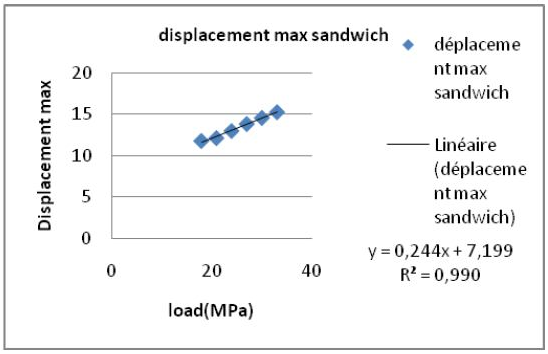
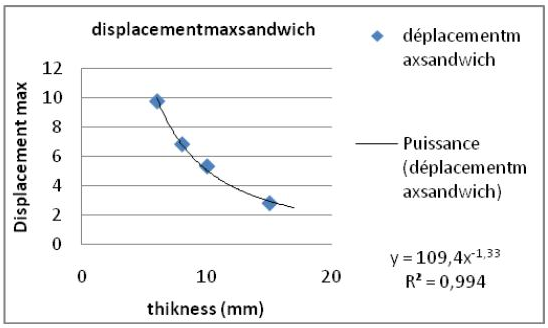


Figure 6. Graphs of displacement in the interval [0.1000] msec (variation of thickness)

IX. CORRELATIONS

In addition, we have used a variations parameter correlation study of load and thickness to summarize the graphs in Figures 5 and 6 above. For this, the maximum amplitudes were taken in each given case in the following graphs:





CONCLUSIONS

This present study-correlation-has allowed us to conclude:

- For the variation of the load, our sandwich plate presents a linear amplitude increase with load.
- The hyperbola regression of amplitudes in accordance with the increase of the thickness has a great advantage both for its economic cost and its behavior remaining in the elastic area.
- Moreover, the non-return to zero in each case at the end of the stroke expresses a residual displacement.

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