A RESEARCH ON THE VALIDITY OF COMPOSITE PENEL REPAIRED WITH THE PRESSURIZER

Song-su Chae[1], Truong Viet Hoai[2] and Jin-hwe Kweon[3]

[123] School of Mechanical and Aerospace Engineering, Gyeongsang National University, Jinju, Gyeongnam 660-701, Korea, [1]chaesongsu@outlook.kr, [2]truongviethoai@gmail.com, [3] jhkweon@gnu.ac.kr

Keywords: Composite repair, Out-of-autoclave, Scarf repair

ABSTRACT

Repair methods using heatblanket cannot apply curing pressure to composite structures. For higher strength recovery rates, it is necessary to apply curing pressure. We have developed a pressurizer to apply the curing pressure, and in this paper we will demonstrate the validity and necessity of the pressurizer.

1 INTRODUCTION

As the applications of composite structures are increasing, the importance of their repairs has been highlighted. Scarf-patch repair is a widely used method for composite structures. For the field repair where autoclave is not available, heat blanket is often used for curing. The problem of using the heat blanket is that it cannot apply enough pressure for the adhesive curing. It may result into the degradation of bonding strength. In this paper, however, it has used a pressurizer designed to be suitable for the field repair with heat blanket. Eventually, additional curing pressure is given during scarf-patch repair. As a result, the scarf-patch repair may have better performance than when only the vacuum was used. The improvement of repair method and the excellence of pressurizer have been demonstrated through the test of mechanical properties. The mechanical tests included static tension at RTD and ETW and a repeated load under the different conditions. A vacuum-only condition means the traditional field repair method where there was no additional curing pressure during patch repair. The pressured condition has additional curing pressure by pressurizer.

Figure 1: The front view of pressurizer.

2 GENERAL SPECIFICATIONS

The parent laminates and repair patches were fabricated using USN-200A, a carbon−epoxy unidirectional prepreg of SK Chemical. WSN-3K, a carbon-epoxy fabric prepreg is used as an external ply. Stacking sequence is $[45^{\circ}/0^{\circ}/-45^{\circ}/90^{\circ}]_{2s}$. The parent laminates and repair patch were separately pre-cured, and then fabricated to have a scarf shape by precise sanding. An epoxy film adhesive, FM300-2 is used for the bonding of each part, such as parent laminates, a patch and an uncured external ply. The uncured external ply is added on the patch and laminates with the adhesive. Finally the structure is cured under the three different conditions which are vacuum-only, mechanically pressured and conventional autoclave conditions. The specimens for test have damage at the center of laminates with the size of 25 mm × 25 mm. The thickness-to-scarf length ratio is 1/30 [1]. Specimens were tested using an instron 5582 and an instron 8801. RTD and ETW conditions were defined following the ASTM D5229 and AGATE-WP3.3-033051-134 standards.

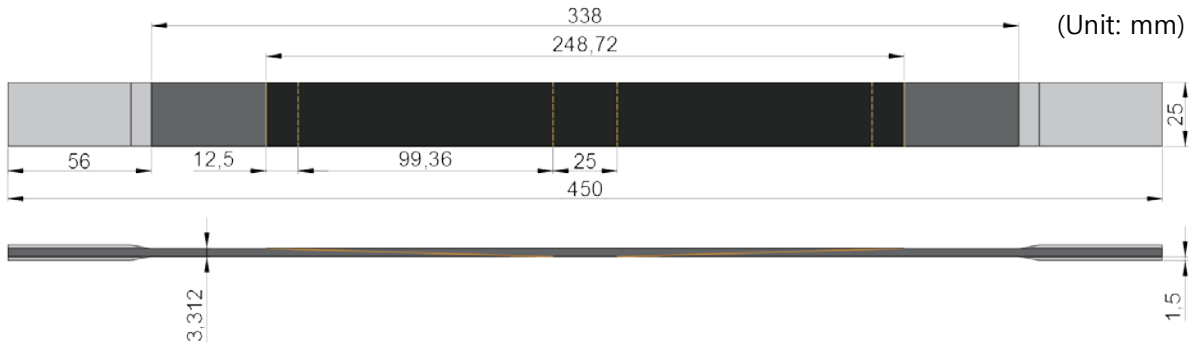

Figure 2: Specimen configuration

3 RESULTS

Static tensile tests and fatigue tests were conducted to verify the pressurizer. The results of the static tensile tests and the fatigue tests of the autoclave specimens were compared with those of the specimens repaired with the pressurizer and heatblanket. We found that there was no big difference in the test results and we verified the

ACKNOWLEDGEMENTS

This work was supported by the National Research Foundation of Korea (NRF) Grant funded by the Ministry of Science, ICT & Future Planning (NRF-2017R1A5A1015311). And this work was supported by Korea Aerospace Industries, LTD.

REFERENCES

[1] Jae-Seung Yoo, Viet-Hoai Truong, Min-Young Park, Jin-Ho Choi and Jin-Hwe Kweon, Parametric study on static and fatigue strength recovery of scarf-patch-repaired composite laminates, *Composite Structures*, Volume 140, 15 April 2016, pp. 417-432.