7. CONCLUSIONS

In this research, the feasibility of inspecting small diameter, non ferrous fluid pressure lines using eddy current was studied in order to detect and analyze internal corrosion. During the experiments, it was found that the eddy current signal for the corrosive areas is significantly different from the other areas of metal tubes. The signal for an internal crack was also obtained and the different signals were then compared. A qualitative analysis is carried out using the test results in order to prove that special eddy current signals were obtained due to internal corrosion.

A suitable ID probe was fabricated to inspect the metal tubes as SLAF was not equipped with ID probes. The ID probe diameter was arranged in such a way that the fill factor should be very close to 1. While inspecting and after analyzing the microstructure examination results, it was found that the pitting corrosion was mostly prominent in the metal tubes. Therefore, it can be concluded that the signals received in this experiments are due to the pitting corrosion.

The importance of this study is that it can be easily applied to inspect the fluid carrying systems of SLAF aircraft. It saves time, manpower, money while improving the safety standards in aircraft maintenance. This study is a door opener for a quantitative analysis of corrosion using sddy current testing on small diamater metal tubes. A properly controlled process would give positive, successful results. A quantitative analysis must be carried out to find the area of corrosion, depth of corrosion and the reduction of material due to corrosion. More variables such as different corrosion types, different depths, different areas, different materials are required to be used in the quantitative experiments.

REFERENCE LIST

[1] Christian Vargel, “Corrosion of Aluminium”, ISBN: 0 08 044495 4, April 2004

[2] A.A. Diaz, R.A. Mathews, J. Hixon1, S.R. Doctor , Pacific Northwest National Laboratory, Richland, WA 99352, “Assessment of Eddy Current Testing for the Detection of Cracks in Cast Stainless Steel Reactor Piping Components”, February 2007

[3] J Hansen, “The eddy current inspection method”, Part 1 to 4, Insight Vol 46, No 7, July 2004.

[4] K Reber[a], A Bonisch[b], [a]Innospection Germany GmbH, Stutensee, Germany, [b]Innospection Ltd., Aberdeen, UK, “Inspection of unusual pipe types with eddy current technologies”, 2004.

[5] W. Lord, Y. S. Sun, S. S. Udpa and S. Nath, "A finite element study of the remote field eddy current phenomenon," in *IEEE Transactions on Magnetics*, vol. 24, no. 1, pp. 435-438, Jan 1988.

[6] Yves Jayet, Bruno Lebrun, Jean-Claude Baboux, “Pulsed eddy current signal analysis: application to the experimental detection and characterization of deep flaws in highly conductive materials”, 1 January 1996

[7] D. Vasic, V. Bilas and D. Ambrus, "Pulsed eddy-current nondestructive testing of ferromagnetic tubes," in *IEEE Transactions on Instrumentation and Measurement*, vol. 53, no. 4, pp. 1289-1294, Aug. 2004.

[8] J. M. A. Rebello, M. C. L. Areiza, C. G. Camerini and J. V. Rocha, "Saturated low frequency eddy current technique applied to microstructure phase quantification in duplex stainless steel”, 2013 Far East Forum on, Jinan, 2013, pp. 1-7.

[9] Kosmas, Konstantinos, Hristoforou, Evangelos, “The effect of magnetic anomaly detection technique in eddy current non-destructive testing”, International Journal of Applied Electromagnetics and Mechanics, Vol. 25, No.1-4, pp.319-324, 2007

[10] Libby Hugo L, Wandling Clarence R, “Eddy current nondestructive testing device using an oscilloscope to identify and locate irregularities in a test piece”, US3302105 A, Jan 31, 1967.

[11] Friedrich M. O. Fiirster, “Eddy current system for testing tubes for defects, eccentricity, and wall thickness”, Reutlingen, Germany 22, US 3693075 A, Oct. 16, 1970 21, Appl. No.: 81,320

[12] F R Bareham, “Choice of frequency for eddy-current tube testing”, British Journal of Applied Physics, Volume 11, Number 6.

[13] Benedetto Bozzini, Marco E. Ricotti , Marco Boniardi, Claudio Mele, “Evaluation of erosion–corrosion in multiphase flow via CFD and experimental analysis”, Volume 255, Issues 1–6, August–September 2003, Pages 237–245, 14th International Conference on Wear of Materials.

[14] Jarmila Woodtli, Rolf Kieselbach, “Damage due to hydrogen embrittlement and stress corrosion cracking”, Engineering Failure Analysis, Volume 7, Issue 6, 1 December 2000, Pages 427–450.

[15] Z Szklarska-Smialowska, “Pitting corrosion of Aluminum”, Corrosion Science, Volume 41, Issue 9, August 1999, Pages 1743–1767.

[16] J.R. Galvele, S.M. de De Micheli, ”Mechanism of intergranular corrosion of Al-Cu alloys”, Corrosion Science, Volume 10, Issue 11, 1970, Pages 795-807.

[17] G. Haller, “Distinguished material surfaces and coherent structures in three-dimensional fluid flows”, Physica D: Nonlinear Phenomena, Volume 149, Issue 4, 1 March 2001, Pages 248–277.

[18] Kent J. Eisentraut, Rebecca W. Newman, Costandy S. Saba, Robert E. Kauffman, Wendell E. Rhine, "Spectrometric oil analysis. Detecting engine failures before they occur", *Anal. Chem.*, 1984, *56* (9), pp 1086A–1094A, August 1984.

[19] Buzz Wincheski, Phillip Williams, John Simpson, "Analysis of Eddy Current Capabilities for the Detection of Outer Diameter Stress Corrosion Cracking in Small Bore Metallic Structures", NASA LaRC, Lockheed Martin Hampton VA 23681

[20] AV Egorov, VV Polyakov, DS Salita, EA Kolubaev, SG Psakhie, AG Chernyavskii, IV Vorobei, "Inspection of aluminum alloys by a multi-frequency eddy current method", ScienceDirect, 28 July 2014.