

## Dealing with Buckling Effect in Snorkel by Finite Element Analysis: A Life Enhancement Approach in CAS-OB Operation

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**Abstract :** The composition adjustment by sealed argon bubbling-oxygen blowing (CAS-OB) process is a process designed for adjusting steel composition and temperature during secondary metallurgy. One of the equipment in the said process is a snorkel or bell, fixed to a movable bracket. Snorkel serves the purpose of feeding ferroalloys into the liquid metal simultaneously removing gases to the gas cleaning system through its port at its top. The bell-shaped snorkel consists of two parts. The upper part has an inside liner, and the lower part is lined on both side with high-alumina castable reinforced with 2% stainless steel needles. Both the parts are coupled with a flange bolt system. These flanges were found to get buckled during operation, and the gap was generating between them. This problem was chronic since its. It was expected to give a life of 80 heats, but it was failing within 45-50 heats. After every 25-30 heats, it had to be repaired by changing and/or tightening its nuts and bolts. Visual observation, microstructural analysis through optical microscopes and SEM, hardness measurement and thermal strain calculation were carried out to find out the root cause of this problem. The calculated thermal strain was compared with actual thermal strain; comparison of the two revealed that thermal strain was responsible for buckling. Finite element analysis (FEA) was carried out to reaffirm the effect temperature on the flanges. FEA was also used in the modification in the design of snorkel flange to accommodate thermal strain. Thermal insulation was also recommended which increased its life from 45 heats to 65 heats, impacting business process positively.

**Keywords :** CAS OB process, finite element analysis, snorkel, thermal strain

**Conference Title :** ICEFA 2019 : International Conference on Engineering Failure Analysis

**Conference Location :** Paris, France

**Conference Dates :** October 29-30, 2019