

1976

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D. Woollatt

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Woollatt, D., "Increased Lift for Feather Valves by Elimination of Failures Caused by Impact (Abstract Only)" (1976). *International Compressor Engineering Conference*. Paper 204.  
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INCREASED LIFT FOR FEATHER VALVES BY ELIMINATION OF  
FAILURES CAUSED BY IMPACT

Derek Woollatt  
Research Laboratory  
Worthington Compressors, Inc.  
P.O. Box 69  
Buffalo, New York 14240

ABSTRACT

The maximum lift that can be used in a feather valve for a particular application is limited by the valve failures that occur if the lift is too high. The feather valve has been used with great success in a wide range of compressors for many years and at the start of the work described here we had a good understanding of the design guidelines to be followed to provide reliable service. However, we hoped to develop feather valves that would perform reliably with lifts greater than those given by the guidelines and thus to improve compressor performance. The approach used to achieve this was to set up a compressor which provides a severe application for feather valves and to run valves with a high lift in this machine. As expected, this caused valves to fail and we then set about determining the cause of failure and changing the valve design to eliminate failures.

It soon became apparent that there was no simple explanation for the failures. All calculated and measured stresses were well within the endurance limit of the strip material, the quality of the strip material as measured in a fatigue test rig was good and inspection of failed strips gave no indication of the reason for failure.

The failures were eventually determined to be caused by the impact of the strip on the guard and several ways of reducing the frequency of failure were discovered. These included changes to the guard contour, shot peening the strips and changes to the guard material. However to date we have not decided what the details of the failure mechanism are and it is felt that while the work presented in this paper did lead to a greatly improved feather valve, it provided more questions than answers on the fundamentals of valve failure.

It is hoped that the questions raised by the work will provide suggestions for further work to research groups working on valve reliability.