

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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KERR MACHINE COMPANY  
Petitioner,

v.

S.P.M. FLOW CONTROL, INC.,  
Patent Owner

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Patent No. 9,879,659

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**DECLARATION OF STEVEN M. TIPTON, PH.D, P.E.**

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I, Steven M. Tipton, declare as follows:

## **I. INTRODUCTION**

1. I have been retained as a technical expert by Kerr Machine Co. (“Kerr”).

2. I have been asked to study and provide my opinions concerning U.S. Patent No. 9,879,659 (“the ‘659 Patent”) and the patentability of its claimed inventions in view of certain prior art references, the state of the art at the time of the claimed inventions, and the knowledge of a person of ordinary skill in the art at the time of the claimed inventions.

3. My opinions and views set forth in this declaration are based on my education, training, and experience in the field of positive displacement pumps, their internal components, and related technical areas, as well Petitioner’s Exhibits 1001-1030, and other materials that are cited and discussed herein.

## **II. BACKGROUND AND QUALIFICATIONS**

4. My curriculum vitae is attached to this declaration as Appendix A.

5. I have a Ph.D. in Mechanical Engineering from Stanford University. I have taught Mechanical Design and Senior Design Projects, along with other undergraduate and graduate mechanics and materials courses at The University of Tulsa for 38 years. I am a fellow of the American Society of Mechanical Engineering and the American Society for Materials. I was a 2010 Distinguished Lecturer for the

Society of Petroleum Engineers and received the H.R. Worthington Medal from the ASME Petroleum Division in 2013. I have been an active industry consultant and hold 9 patents with another pending.

6. My work as a researcher and consultant has included high-pressure equipment used in the oilfield, including work on both the power and fluid ends of positive displacement pumps. I conducted a comprehensive multiaxial fatigue life analysis on crankshafts in the power end of positive displacement pumps in 1993 for a company called Twentieth Century Manufacturing (which was purchased by Gardner Denver in the mid 1990's). I conducted two major research projects to study and optimize the fatigue behavior of fluid ends in positive displacement pumps. The first was from 1990-95 with Schlumberger and the Oklahoma Center for the Advancement of Science and Technology, and the second from 2011-2014 with Gardner-Denver. Both of these projects focused on optimizing the beneficial influence of autofrettage to maximize the endurance of the crossbore intersections. Many other structural/functional aspects of fluid ends were considered during this research, as autofrettage had the potential to affect other high stress regions, such as o-ring glands, and could distort the overall geometry of the fluid end, affecting its assembly to the power end.

7. I conducted a one-year sabbatical leave project with Schlumberger in 1991. A major portion of this was developing a design algorithm to properly include

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