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Finite life hydraulic filter pressure/life rating — Method for verifying the fatigue life rating and the burst pressure rating of the pressure containing envelope of a spin-on hydraulic filter

(NFPA/T3.10.17-1995)
Reaffirmed 2019

Descriptors: filter/separator housing, hydraulic fluid power; fluid power; pressure, cyclic test; pressure, rated fatigue; pressure, finite life rated fatigue; pressure, minimum burst; pressure, static test; pressure rating, by similarity; pressure rating, by test; pressure rating, filter/separator housing.

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Foreword

This Foreword is not part of NFPA Recommended Standard *Finite life hydraulic filter pressure/life rating — Method for verifying the fatigue life rating and the burst pressure rating of the pressure containing envelope of a spin-on hydraulic filter*, NFPA/T3.10.17-1995.

At the October 1981 meeting of the Hydraulic Filter and Separators Section (T3.10) it was recommended that a standard be developed which would include methods for verifying the rating of the static and fatigue pressure strength of a finite life hydraulic filter disposal element container (spin-on filter). Kendall McBroom (Nelson Industries) agreed to serve as Project Chairman.

The NFPA Technical Board approved the TSP on 26 May 1982. Numerous drafts were prepared and reviewed by the Project Group.

On 6 March 1991 the Project Group met and it was recommended to submit Draft No. 8 with revisions and annex A for General Review including changing “confidence level” to “verification level”. T3.10 concurred with the Project Groups recommendation at their meeting. NFPA's Technical Staff prepared the document for General Review on 10 May 1991.

The General Review closed with several comments which were discussed at the 21 August 1991 Project Group meeting. Changes were made to the document and to the TSP. The title was changed from “Finite life hydraulic filter supplement No. 10 to NFPA Recommended Standard Fluid power systems and products — Method for verifying the fatigue and establishing the static pressure rating of the pressure containing envelope of a metal fluid power component“ to ”Finite life hydraulic filter pressure rating — Method for verifying the fatigue and establishing the burst pressure rating of the pressure containing envelope of a spin-on hydraulic filter.”

The Technical Board approved the change in title on 16 January 1992. The document was prepared by Headquarters and sent out for a Second General Review on 3 February 1992. The Project Group met on 19 August 1992 to discuss the comments received. Several changes were made to the document. The Project Group met on 19 August 1992 and 11 November 1992 to review the document. The Project Group met again on 24 March 1993 and agreed to send the document out for a Third General Review.

The document was sent out for a Third General Review on 31 March 1993. The Third General Review closed with comments from five companies. The Project Group met on 19 August 1993 to discuss these comments.

Project Chairman McBroom updated the document and the Project Group met on 17 November 1993 to review the Proposed Fourth General Review Draft. The Project Group voted to send the document out for Balloting after changes were once again made to the document. Project Chairman McBroom updated the document and submitted Draft No. 9 to Headquarters on 1 December 1993.

Project Chairman McBroom again updated the document due to Technical Board action. Draft No. 10 was discussed at the Project Group meeting held 9 February 1994. The Project Group agreed to send the document out for a Fourth General Review.

The document was sent out for a Fourth General Review on 8 March 1994. The Fourth General Review closed with comments from six companies. The Project Group reviewed these comments at their 25 May 1994 meeting and voted that when the commentators signed off the document should be sent to the Technical Board for approval to Ballot. Project Chairman McBroom wrote to all the commentators on 1 June 1994 and sent an updated document to Headquarters.

The revised document was put on the 18 August 1994 Technical Board agenda for approval to Ballot. The Technical Board approved the document and it was sent out for Ballot on 19 August 1994. Balloting closed with no negative votes and two approval votes with editorial comments. These comments were resolved at the 22 September 1994 T3.10 meeting. At the same meeting it was voted to put this document on the next Technical Board agenda for final approval. Chairman Kendall McBroom added the editorial changes to the document and it was updated at Headquarters.

This document was granted final approval at the 8 December 1994 Technical Board meeting.

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Introduction

In fluid power systems, power is transmitted and controlled through a fluid (liquid or gas) under pressure within an enclosed circuit. A basic requirement of fluid power components is that they should be capable of adequately containing the pressurized fluid.

The pressure that an individual component can normally be subjected to has a relationship with the rated fatigue and minimum burst pressures. This relationship may be estimated and used as a basis of total life expectancy for the component in an individual application. Such an estimate must be applied by the user and factors such as shock, heat, misuse, etc., must be judged by the user in its application. The selection of a specific pressure and life expectancy for a component in such an individual application may be based upon the rated fatigue and burst pressure as prescribed in figure 1. This finite life pressure rating test procedure is different than the basic T2.6.1 R1 infinite life pressure rating document and can be visualized from the figure 1, S-N diagram. The standard T2.6.1 R1 is a rating system along the vertical axis, with its fatigue strength distribution and assurance level in the vertical direction at a defined life. The finite life hydraulic filter is a rating system along the horizontal axis, with its fatigue life distribution and assurance level in the horizontal direction at a defined stress (pressure).

Because the service life of the element container for a finite life hydraulic filter (spin-on) is relatively short, a fatigue life of 100,000 cycles (∅) is judged sufficient for common industrial ratings. Cycle life ratings other than 100,000 cycles are permitted and this standard may be applied for those cases. The method of rating includes both pressure and minimum life – see clause 19 for the proper description.

The pressure rating of the filter head or mounting base would, however, be subjected to the full 10^6 fatigue cycles (RFP) established by NFPA/T2.6.1 R1.

The spin-on can, because of its construction, is tested and evaluated as an elastic body with specific pressure cycle test times and pressure rise rate conditions.

It should be noted that this document deals solely with verification of ratings of a spin-on filter. Separate from this verification procedure, manufacturers have the continuing responsibility to utilize managerial controls necessary to test representative production spin-on filters.

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HEADQUARTERS NOTE The Project Group which developed this test standard intended it as a stand-alone document, unrelated to the basic pressure rating document, NFPA/T2.6.1 R1. The Project Group identified unique features of the spin-on filter which dictated that a structural test be conducted on it as a finite life component and as an elastic body. Elastic components are excluded from the basic NFPA/T2.6.1 R1 pressure rating philosophy.

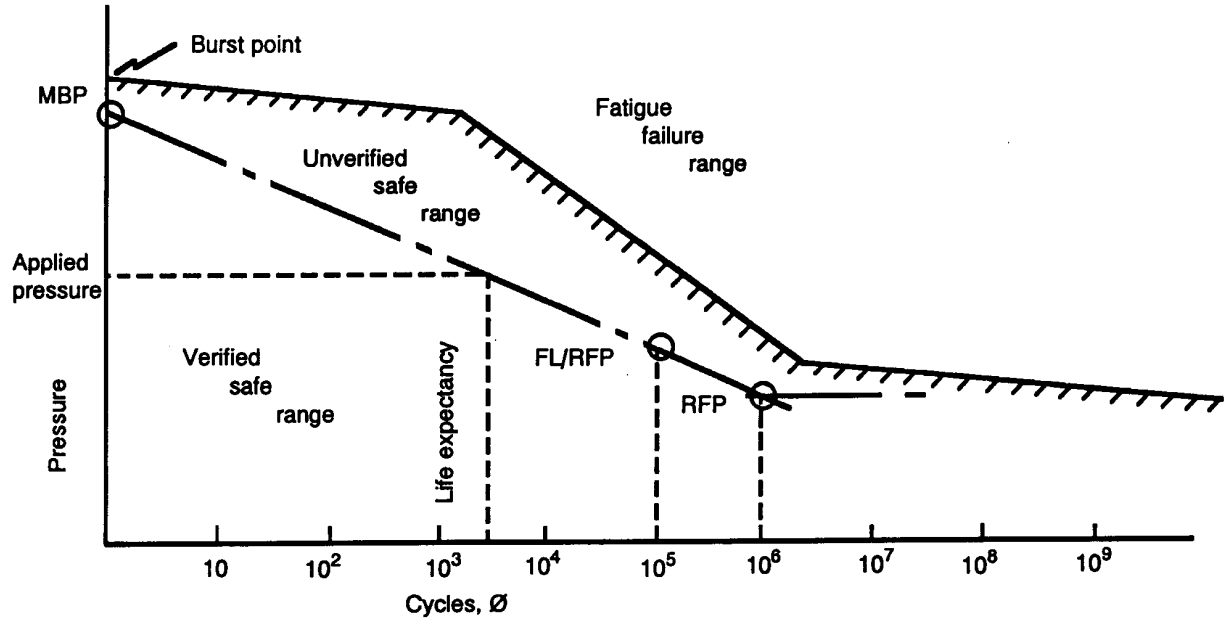

Figure 1 — Possible S-N curve method for estimating finite life rating

1 Scope

1.1 To include methods for verifying the ratings of the burst and fatigue pressure strength of a finite life hydraulic filter, disposable element, container (spin-on filter).

1.2 The purpose is to provide standard methods for verifying the fatigue and static burst pressure ratings of the metal housing of a finite life hydraulic filter with regard to cyclic and steady pressure loads.

1.3 Because the service life of the element container for a finite life hydraulic filter (spin-on) is relatively short, a fatigue life of 100,000 cycles (∅) is judged sufficient for common industrial ratings.