

CLAIMS

What is claimed is:

1. A system (200; 250; 290; 400) characterized by:
a seal (206; 294; 424) for an area between a housing (252; 402) and a hanger (204; 404) of a wellhead (112), the seal having an enclosed space (210, 214, 212; 296A, 296B) that traverses a first section (276; 294A) and a second section (278; 294B) of the seal, and that circumvents a U-cup space (274; 294C) provided for energizing the seal; and
a port (258; 290C) accessible from the housing to the enclosed space.
2. The system of claim 1, further characterized by:
a pressure applicator (220) for applying fluid into the port at a pressure; and
a pressure gauge (218) for monitoring the pressure of the fluid to determine an integrity of the seal against one of the housing and the hanger, by the pressure falling within predetermined ranges.
3. The system of claim 1, further characterized by:
an energizing ring (216, 266; 302; 304) for filling the U-cup space to energize the seal for normal operation by causing the first section of the seal to press against the housing and for causing the second section of the seal to press against the hanger.
4. The system of claim 1, wherein the energizing ring is one of: helical springs or elliptical coil springs, helical wound springs, v-springs or cantilever springs, and continuous contact springs.
5. The system of claim 1, wherein the seal is formed of a metal alloy material characterized by one or more of: an alloy of seal, stainless steel, and nickel alloy.
6. The system of claim 1, wherein the enclosed space within the seal is formed of connected drill holes in each of the first section and the second section, and allows the circumvention of the U-cup space.
7. The system of claim 1, wherein first section of the seal and the second section of the seal characterized by separations forming a first portion (408, 412) and a second portion (410, 414) for each of the first section and the second section of the seal so that there are four locations of the seal pressing against the housing when the seal is energized.

8. The system of claim 1, wherein the enclosed space within the seal is formed by one or more of: Electrical Discharge Machining (EDMing), 3-Dimensional (3D) printing, powder sintering, and casting.

9. The system of claim 1, further characterized by:

a middle section (280) of the seal that is machined and left open to form at least a channel (262) between a bottom of the seal and a lock ring energizer element (272), the channel forming part of the enclosed space in the seal.

10. The system of claim 1, further comprising:

an alarm connected to a gauge for monitoring a pressure of fluid applied to the enclosed space so that a change in an expected pressure range triggers the alarm.

11. A method for enabling integrity testing of a seal against a housing and a hanger of a wellhead characterized by:

providing (502) an enclosed space within the seal for an area between the housing and the hanger of the wellhead, the enclosed space traversing a first section and a second section of the seal, having an opening for a port at the second section of the seal, and circumventing a space provided for energizing the seal; and

providing (504) a port that is accessible from the housing to receive fluid to the enclosed space and to monitor the fluid for integrity of the seal.

12. The method of claim 11, further characterized by:

monitoring (510) a pressure of the fluid, the pressure applied increasingly from a lower value to a higher value of a range of pressure values; and

determining (512) an integrity of the seal against one of the housing and the hanger as the pressure is applied increasingly.

13. The method of claim 11, further characterized by:

providing (506) a tool to position the seal between the hanger and the housing;

applying (508) the fluid to the enclosed space via the port; and

determining (512) that an issue exists for the seal against one of the housing and the hanger when a pressure of the fluid falls outside one or more predetermined ranges.

14. The method of claim 11, further comprising:

monitoring gases received as the fluid within the enclosed space; and
determining integrity of the seal against one of the housing and the hanger based
at least in part on the gasses being well-formation gasses.

15. The method of claim 11, wherein the fluid is applied under pressure to the
port for a predetermined time period at predetermined time intervals.