TECHNICAL NOTE

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Jointing characteristics of VI and VIDH rings

Introduction

The "Vinyl Iron" (VI) lip seal gasket has been in use for many years and has proved very reliable. It was first introduced for "Vinyl Iron" PVC-U pipes with Series 2 diameters in the 1980s, and was adopted for Oriented PVC (PVC-O) S2 pipes a few years later. In 1990 its use was extended to PVC-M S2 pipes.

In 2003, the Australian Standard 4441(Int) for PVC-O pipes was revised to allow higher stress ratings. This had the effect of allowing a PN12 pipe to be uprated to PN16, and introduced the PN16 users to a pipe with reduced wall thickness. Curiously, although pipes of this thickness had been in use for many years, the new users had some difficulties.

This note describes the investigation work undertaken, the findings as to the cause of difficulties, and the remedies - including the development of a new ring, the Vinyl Iron Dual Hardness (VIDH) ring.

"Jointability"

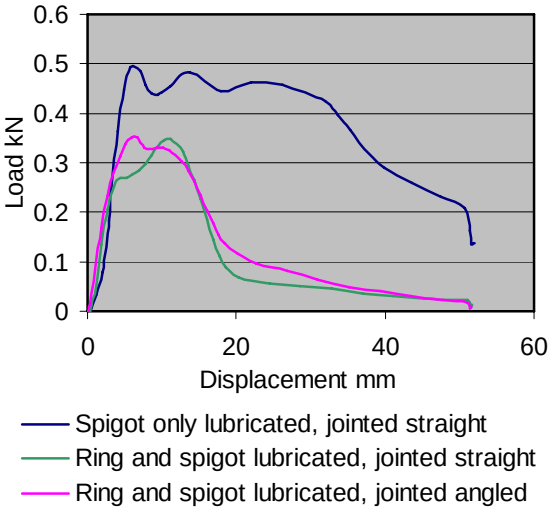
By this (for want of better word) is meant, basically, how forgiving the joint is to abuse by the operator. Thinner walls limit the size of chamfer available to guide the spigot, increasing the chance of ring pick-up, and the lower stiffness makes it more difficult for the operator to detect by feel that this has happened. The traditional mistakes such as lubricant or water on the ring seating, which might be tolerated with a larger chamfer, become more likely to result in a "pushed" ring.

Investigations

Primarily, the field problems related to DN100 pipes, although there were reports of some DN150 problems also. Eighteen DN100 joints were returned from the field, all with "pushed" rings. Dimensional checks were carried out on both spigots and sockets. No consistent pattern relating diameters, ring groove geometry or chamfers could be discerned. In particular, the length and depth of the chamfers was studied. Although there were short chamfers, there were also long ones, and no correlation was evident.

Jointing tests on DN100 VI rings were conducted using an Instron Testing Machine (with a new spigot and socket), simulating various levels of "abuse":

Fig 1: VI ring jointed with chamfered spigot



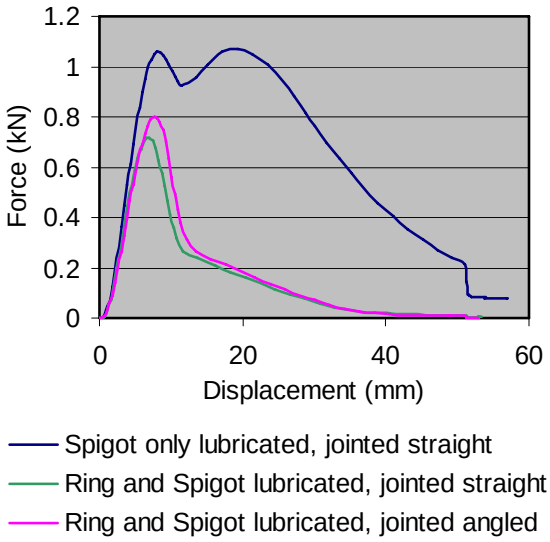
The first test in Fig 1 is the standard recommended procedure for jointing with lubricated spigot. Maximum jointing force is 0.5kN, which is easily achieved with a bar and block. The subsequent two tests, using the same joint, had the ring lubricated (from the previous test), and show a lower maximum jointing force. Although it is acceptable to make joints with lubricant applied also to the ring, it is not recommended, since the joint lacks grip once made, and it is difficult to maintain the positioning to the witness mark.

In order to study the effect of the chamfer, tests were conducted with no chamfer, but de-burred to a 1 mm 45º bevel.

It can be seen in Fig 2 that while the maximum jointing force is approximately doubled, by using

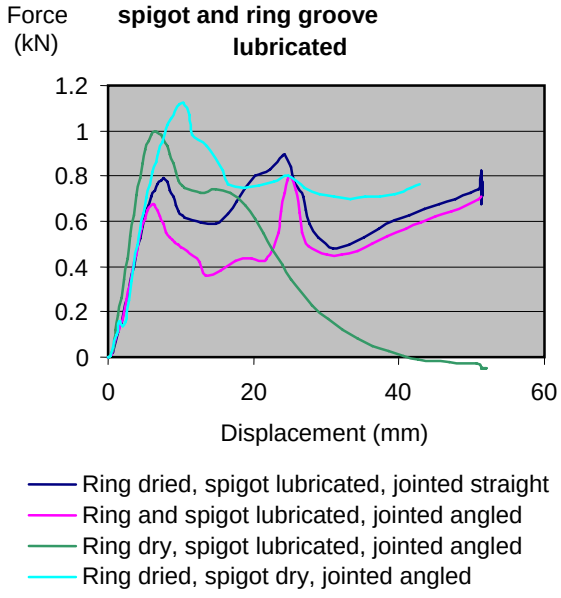
an unchamferred spigot, there is basically no problem, and the joint can still be made with a bar and block.

Fig 2: VI Ring jointed with spigot unchamfered



Finally, the joint was tested with lubricant applied to the ring groove, in contact with the back of the ring.

Fig 3: VI Ring jointed with unchamfered spigot and ring groove lubricated



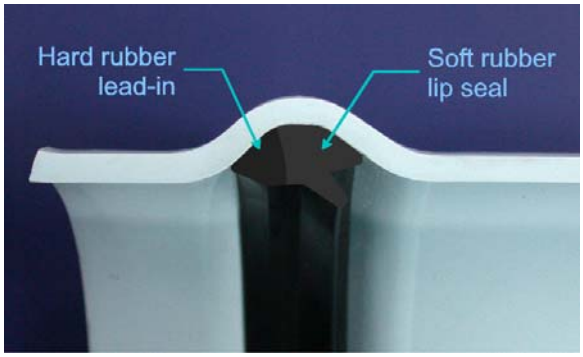
The extended high force levels show that the ring was pushed through and sandwiched between the spigot and socket body. This clearly identifies the lubricated groove as a primary cause of pushed rings.

This may occur with an inexperienced operator handling the ring with lubricant on his hands, or from the process of cleaning the ring groove with the same cloth used to wipe lubricant from the hands. A wet ring groove from dew or rain will likely provide sufficient lubrication.

The VIDH ring

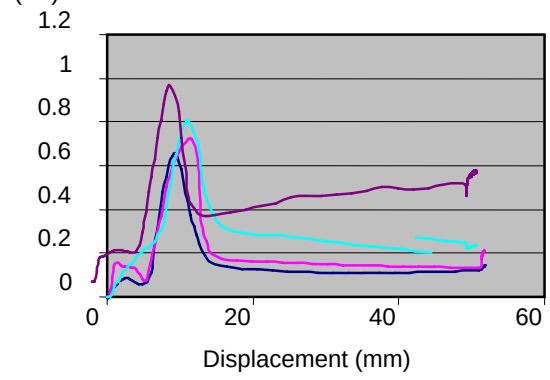
A decision was made to re-engineer the ring for greater installer tolerance. This was done with the assistance of Gulf Rubber. The new VIDH ring (Fig 4) has a hard nose flush with the socket to deflect the spigot and prevent the edge of the nose picking up the ring.

Fig 4: VIDH dual hardness seal. Hard nose guides spigot, preventing ring pick-up.



Jointing tests on the VIDH ring are shown in Fig 5. The ring was not dislodged under the most adverse conditions.

Fig 5: VIDH Ring jointed with unchamfered spigot and ring groove lubricated



Conclusion

The VI ring is vulnerable to dislodgement or "pushing" with lubricant on the back of the ring or in the ring groove. The VIDH ring is more forgiving of installer error in this respect.

For further information about our products and applications, see our web site at

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