

# FermZilla Design Revision

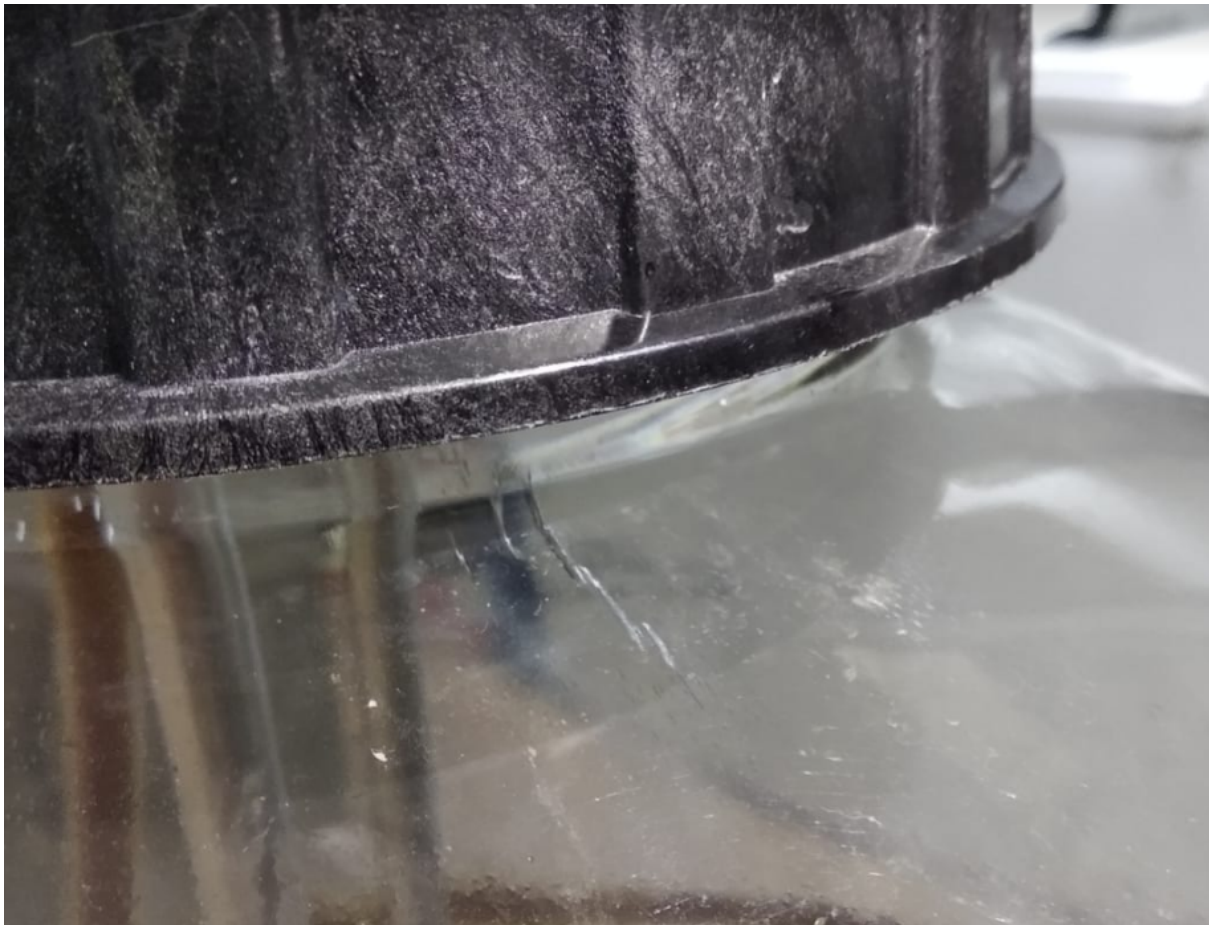


**KegLand Distribution PTY LTD**

**[www.KegLand.com.au](http://www.KegLand.com.au)**

In late 2019 it was noticed that a small number of Fermzilla tanks had exhibited a small stress mark around the neck of the tanks.

This stress mark was only noticeable in a small number of tanks after they had been used a number of times.



Although it's difficult to track the exact reason for these marks we believe that it could be caused by environmental stress cracking, incompatible chemical cleaners, repeated cycling beyond the rated pressure of the tank or simply excessive stress in the neck area of the tank.

By the start of 2020, 4 known issues like this had been identified and reported to by customers. This concerning issue was addressed with several changes to the:

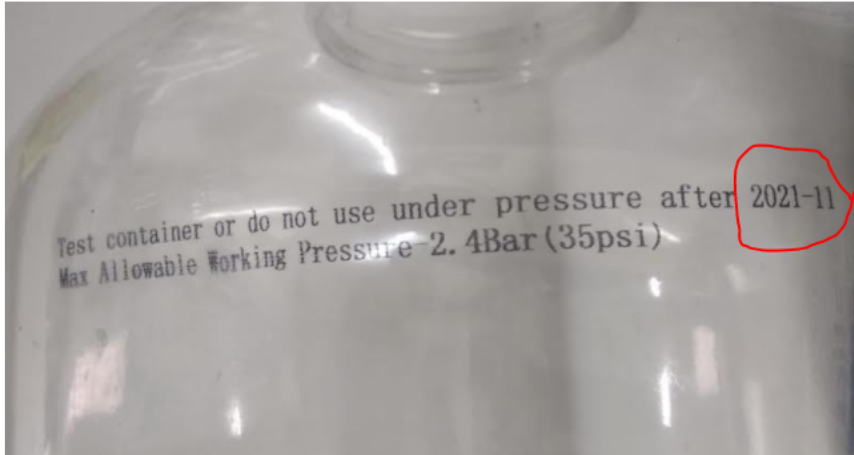
1. Manufacturing process
2. Testing procedure
3. Blow mould design

These changes have been outlined in this report.

## Re-Test Dates

All FermZilla tanks manufactured by KegLand have been made with a re-test date. This date identifies which batch of tanks it was made in and is the date at which the customer should re-hydrotest the tank. The specific re-test date relates back to a log of environmental conditions, resin specification sheet, manufacturing parameters etc.

Through this report this date is referred to as the re-test date.



**Image 1: Tank made with re-test date Nov 2021**

## **1. Manufacturing Process Changes**

The FermZilla tanks are made from a high long chain PET resin that is particularly sensitive to moisture. During the manufacturing process it was observed through various chemical testing that improvements could be made in the handling, drying and processing of the plastics to reduce damage to the resin. Some of these changes included:

- a) Improved drying method and higher drying specification
- b) Reduced overall IV loss and damage to the resin in the injection moulding process
- c) Improved handling, storage of preforms and log of rotation of preform stock
- d) Improved machine processing parameters

## 2. Testing Procedure

All Fermzilla tanks ever manufactured have always been pressure tested to at least 2 times the working pressure or greater. Tanks manufactured with re-test date prior to 2020 were raised to the test pressure for approximately 2 minutes before releasing the pressure. Certain observations were made to the tank and once a pass had been determined it would be marked with the retest date and packaged for sale.

As some concerns had been highlighted regarding ongoing repeated stress related marks around the neck additional testing was implemented.

a) For Tanks manufactured after 2020 additional cyclical testing was adopted involving each tank being cycled with the test pressure then back down to 0(atmospheric pressure) then back up to the test pressure 10 times to ensure no cyclical stress would be observed.

b) In addition to the testing above a sample set of tanks taken from the start and end of each production run are also tested more vigorously and tested to 1000 cycles which happens for several days. If any noticeable stress marks are observed then the entire batch is rejected.

### **3. Blow Mould Design Change**

When the FermZilla tanks were first designed they were designed specifically to fit into a low head space to make the tanks as compact as possible. To facilitate this objective a torispherical design was adopted for the top of the tank. This shape was only used on the FermZilla 27L, 35L and 55L Conical Tanks. In order to reduce stress on the neck of the FermZilla, the shape of the top of the tank was changed to hemisphere. This had the negative effect of increasing the height of the tanks by approximately 15mm however this design change enabled the tanks to resist higher working pressures and increase overall tank robustness.

FermZilla All Rounder tanks were manufactured with this new taller “dome” design and as a result and only started getting manufactured with the new modified shape. As a result we did not see the related stress on the neck for the All Rounder designs and no design update was necessary.

The old design with retest date prior to December 2021 are shown below with the shorter torispherical top are shown below.

## **FermZilla Design**

Tanks with expiry date prior to 2021 (Aug 2021, Sep 2021, Oct 2021, Nov 2021, Dec 2021)



All tanks manufactured with a retest date after Dec 2021 had the new taller dome shape as shown below.

## **FermZilla Design Updated**

Tanks with expiry date after 2021

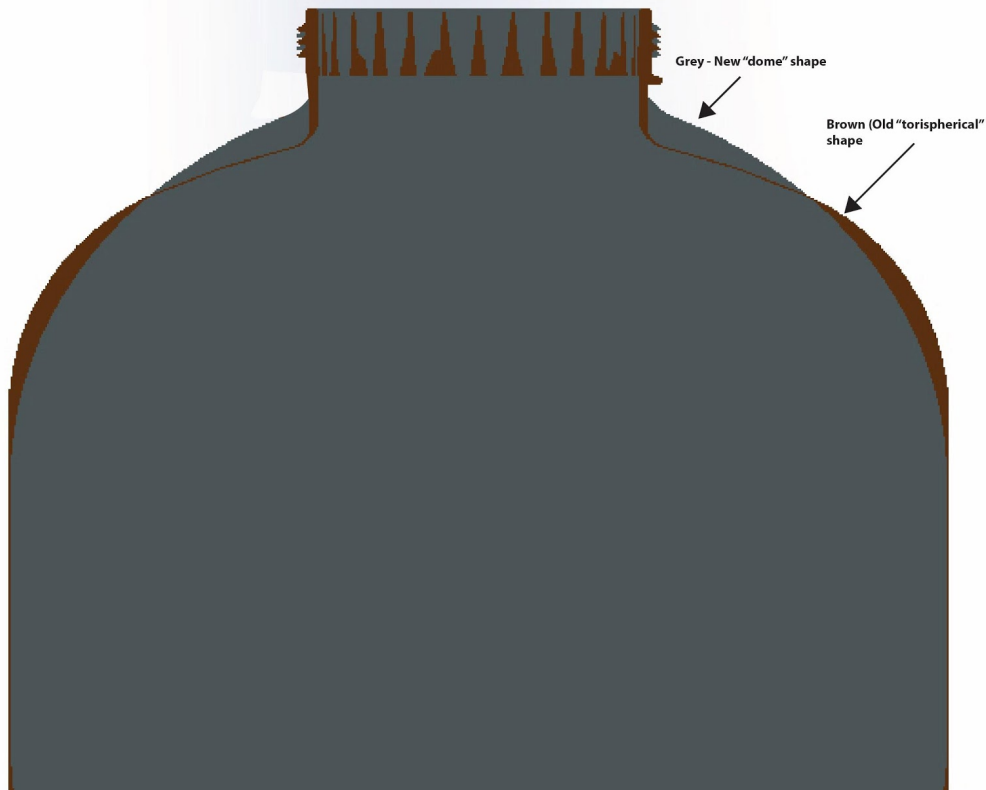




The image below shows the two tank shapes superimposed on top of each other with the brown showing the old tank and the grey shows the new tank design.

## FermZilla Superimposed

Design change made to increase pressure holding capacity and reduce fatigue around neck area.



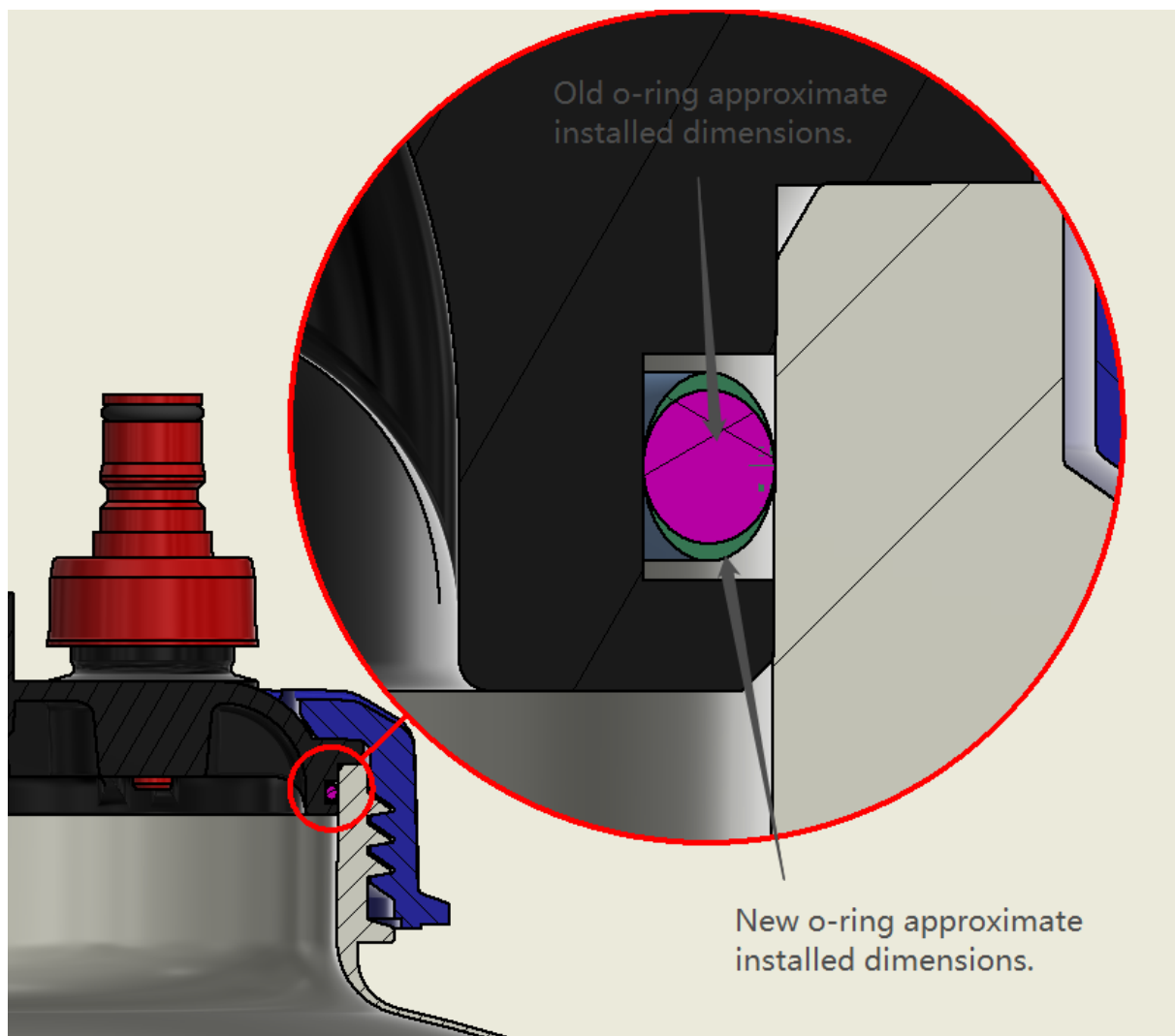
#### 4. Sealing element changes

After initial release, feedback was received from a small number of customers with sealing issues concerning the lid of the FermZilla Unitanks. Sealing issues would generally occur after a couple of uses.

The issue was able to be traced back to a combination of o-ring memory and slight out of roundness in the neck of the tanks that is inherent in any PET vessel with a mouth of this size. The decision was made to increase the cross sectional area of the o-ring in the lid of the FermZilla to a size that is slightly larger than what would normally be used in an equivalently radial sealing application in machined components.

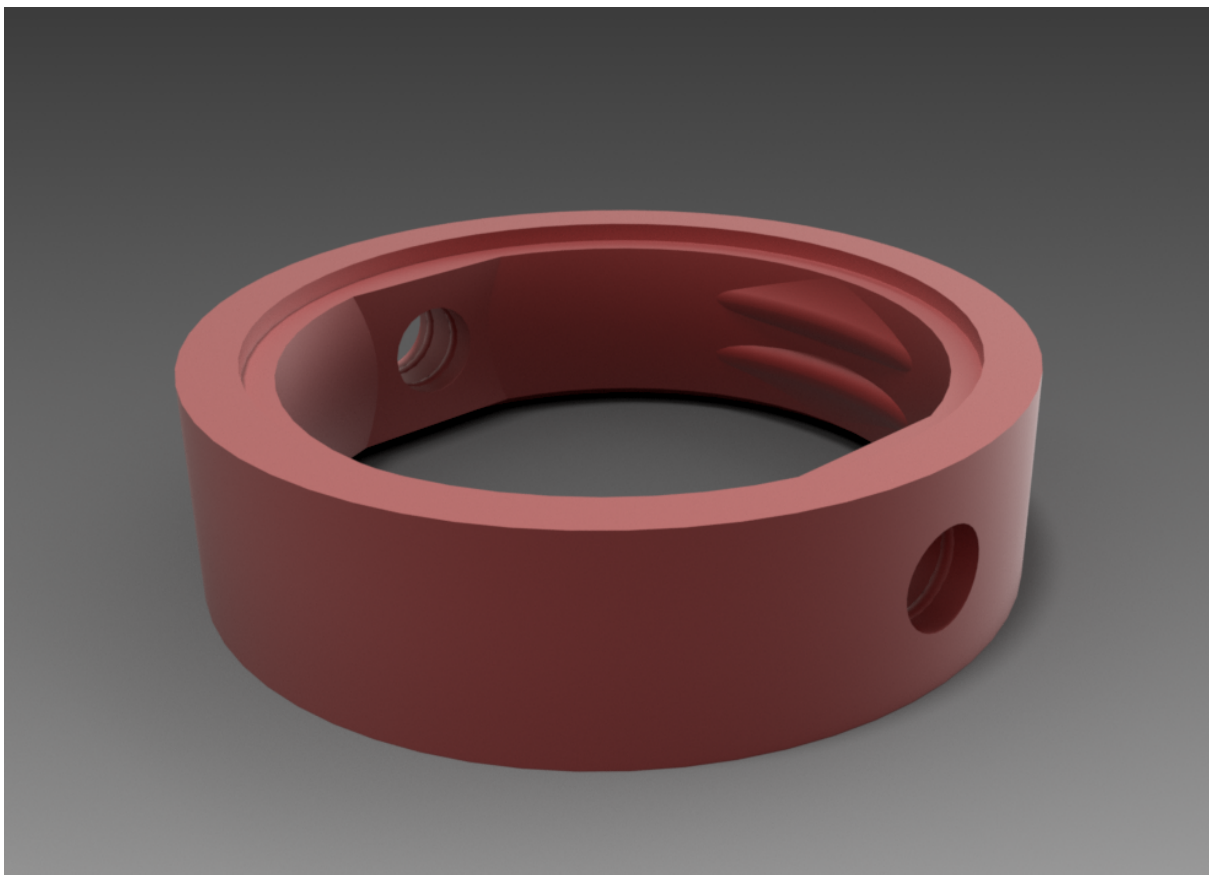
These changes were made soon after release and no negative feedback regarding the lid sealing has been received since.

The image below shows the approximate difference in installed o-ring dimensions. There is significantly more compression in the new o-ring.



We occasionally received feedback from customers about a very slow drip occurring from the butterfly valve seal. This drip seems only to occur under certain conditions, namely when rapidly cold crashing under pressure. This issue can be traced to a slight mismatch in the coefficient of thermal expansion in the various components of the butterfly valve coupled with the compression set of the seal material. It is not possible to match the coefficients of thermal expansion in these parts, so the decision has been made to switch the seal material to a different elastomer with a lower durometer and better compression set. The butterfly seal in the most recent FermZillas will be made from Silicone. Silicone is a very reliable sealing material and typically has equally good chemical resistance, as the previous EPDM seals, to the beverages and cleaning chemicals that it will see under normal usage conditions. Seals are backwards compatible with previous valves.

Butterfly seal image below.



Installed butterfly seal (yellow) in dump valve assembly.



## 5. Collection Container PRV

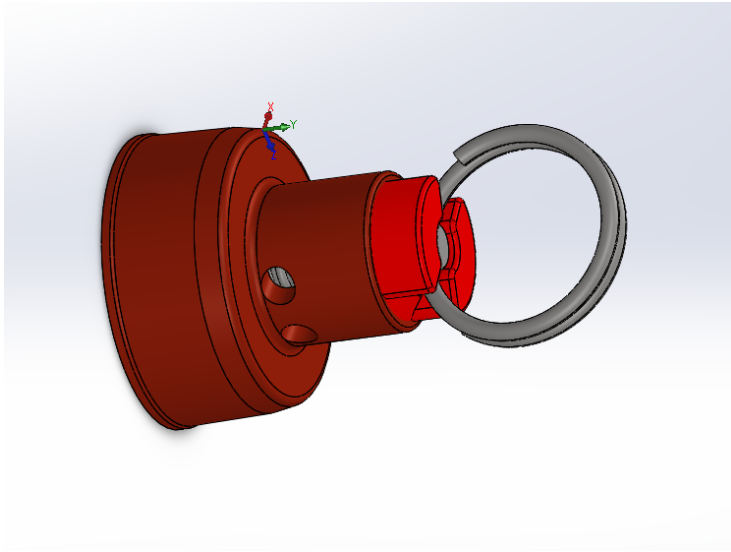
The instructions for the FermZilla Conical specifically state not to allow fermentation to continue in the collection container when the butterfly valve is closed. Fermentation in the closed collection container is no different to fermentation in a bottle and excessive pressures can cause the collection container to rupture. For this reason it's required that if you close the butterfly dump valve that you also remove the collection container as well.

With that said, on a couple of instances customers have forgotten to do this and continued fermentation can cause the build up of pressure causing the collection container to leak or rupture.

The standard assembly includes a male thread on the collection container and a standard black cap as shown in photo below.



As a result of some customers not following the instructions perfectly at the end of 2020 KegLand will also have a pressure release valve cap that will replace the standard black cap. This part will look like this:



When fitted this cap will give an added level of safety and ensure that even if a customer accidentally closes the dump valve and has continued fermentation in the collection container the chance of damage to the Fermzilla collection vessel will be greatly reduced.