TECHNISCHE
UNIVERSITÄT
MÜNCHEN

Forschungszentrum Weihenstephan
für Brau- und Lebensmittelqualität

BERICHT

EHEDG 01 cleanability test

circumferential piston pump ZP series

Test-No. 265 / 24.09.2010

JEC LTD.

Gyeonggi-do, South-Korea

The report covers 11 pages with 1 appendix, 4 figures and 1 table.

The test results apply only to the subject equipment.
The tests have been carried out according to the test requirements by trained personnel.

Draft

Dr.-Ing. Fritz Jacob
Technische Leitung

Weihenstephan,
16. December 2010

Deutscher Akkreditierungs Rat
DAP-PL-3480.00

Akkreditierung nach DIN EN ISO/IEC 17025:2005 für: „mikrobiologisch-hygienische Untersuchungen an Maschinen und Apparaten der Lebensmittelverarbeitung“

The present report is done in cooperation with Dr.-ing. Jürgen Hofmann.

Weihenstephan, 16. December 2010 Dr.-Ing. Jürgen Hofmann
Hygienic Design Expert

Summary

JEC LTD., 32-8 Hwadang-ri, Paltan-muyn, Hwaseong-si Gyeonggi-do, 445-971, South-Korea, commissioned the Research Centre Weihenstephan for Brewing and Food Quality, Technische Universität München in Weihenstephan, Germany, to perform the EHEDG Cleanability Test Method [1] to test the cleanability of the food contact surface of an circumferential piston pump. For this, a circumferential piston pump ZP series with an in- and outlet pipe diameter of 1,5" (DN 32) was provided as an example for this pump series.

The test results show that the wetted surfaces of the circumferential piston pump type ZP series are easy to clean and the cleanability is comparable with the reference pipe. The tests were conducted three times on the circumferential piston pump. The results of the individual tests are comparable with each other. The circumferential piston pump ZP series corresponds to the Hygienic Design requirements according to EHEDG-Doc. 8, 2nd edition, 2004 [2].

Content

1. Purpose

JEC LTD., 32-8 Hwadang-ri, Paltan-muyn, Hwaseong-si Gyeonggi-do, 445-971, Korea, commissioned the Research Centre Weihenstephan for Brewing and Food Quality, Technische Universität München in Weihenstephan, Germany, to perform the EHEDG Cleanability Test Method [1] to test the cleanability of the food contact surface of an circumferential piston pump. For this, a circumferential piston pump ZP series with an in- and outlet pipe diameter of 1,5” (DN 32) was provided as an example for this circumferential piston pump ZP series.

2. Description of the test object

Name of test object	circumferential piston pump
Type	ZP series
Unique model code.	--
Diameter of the ports and reference pipe	1,5“ (32 mm) 1,0“ (25 mm)
Materials of construction	Stainless steel AISI 316L
Surface Finish specification	All surface are free of imperfections; Stainless steel: polished with Ra-value < 0.8µm Seals: smooth and nonporous
Type of seal	O-ring mechanical seal
Material of Seal	O-ring: EPDM mechanical seal: ceramic (Ra-value 0,1 µm), tungsten carbide

A sectional view of the test object is shown in figure 1. Further detailed information on the test object is given in Appendix A.

Figure 1: Sectional view of the circumferential piston pump

3. Time schedule

The test object arrived at the Research Centre Weihenstephan for Brewing and Food Quality, Technische Universität München in Weihenstephan, Germany in September 2010 and was registered under test no. 265/24.09.2010. The investigation was carried out from 27.October to 8. December 2010.

4. Method and material

Before conducting the test program, all applied elastomeric components were checked against the test strain for antimicrobial properties. Prior to testing, the test object and the reference pipe (having a 0.5 µm Ra internal roughness) were dismantled, thoroughly cleaned and degreased by hand, reassembled and steam-sterilized in-line or autoclaved at 121˚C for 30 minutes.

The test object and reference pipe were reassembled with an auxiliary pipe and soiled under 5 bar (gauge) pressure with a soured milk solution with spores of the test strain *Geobacillus stearothermophilus* var*. calidolactis* , mixed to give a final concentration of approx. 10^5 spores per cm^3 in the milk. The air pressure of 5 bar was applied 3 times to be closed assembly and held at pressure for 2 minutes at each occasion. All movable parts have to be opterated during the pressuring phase. After draining and drying by flushing with dry filtered air at a velocity of 1.0 m/s for minimum of 2 h. The test object was cleaned in-place in an in-place cleaning test rig [Fig. 2] by:

- Rinsing with cold water for 1 minute;
- Circulating a 1% (w/v) detergent solution at 63 ˚C± 2 ˚C for 10 minutes;
- Rinsing with cold water for 1 minute.

During the whole CIP cleaning process the mean velocity of liquid flow in the reference pipe was 1.5 m/s. A back pressure of 1.5 bar g was set during all stages of the CIP cleaning runs. At the end of both rinsing procedures samples of the outflowing water were taken and were pour-plated with modified Shapton and Hindes Agar (MSHA).

After cleaning the inner surface of the test object and reference pipe was covered with molten MSHA. After the agar bad fully solidified the test object and reference pipe were placed in an incubator at 58 °C for 18 hours.

After incubation the test object and reference pipe were examined for the presence of yellow discoloration in the agar. The degree of discoloration in the agar taken from the test object was compared to the degree of the discoloration in the agar taken from the reference pipe.

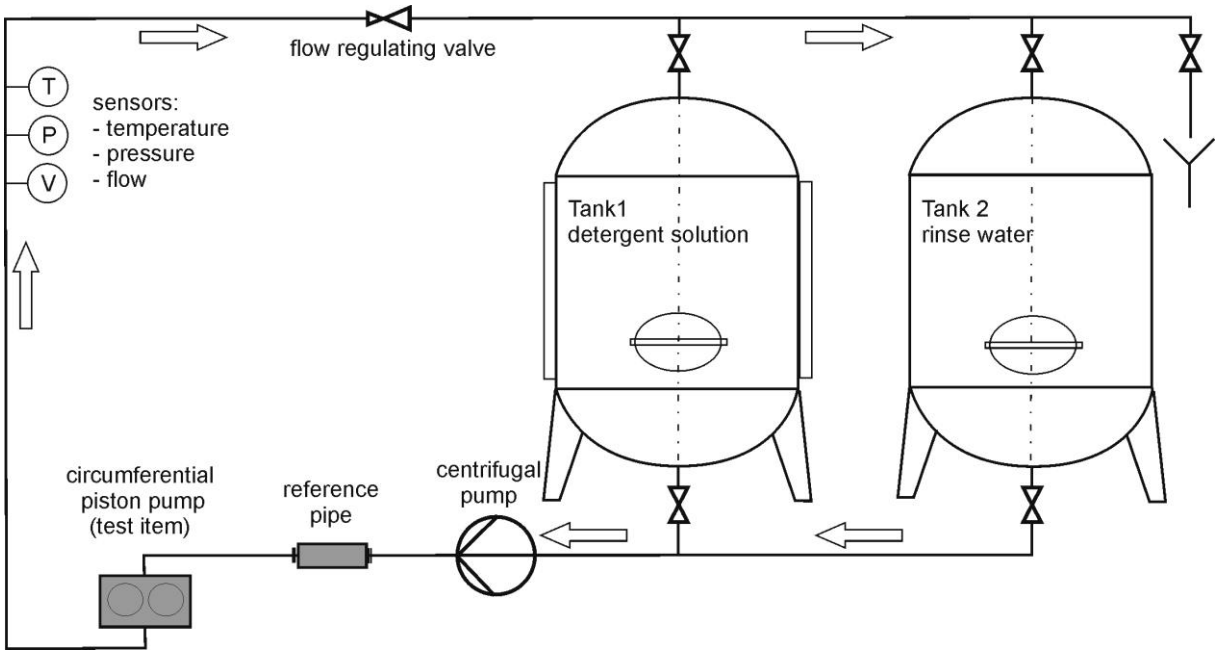


Figure 2: Testrig for CIP-cleaning

4.1. Specific testing conditions

No specific testing conditions were applied. The test was done according the published EHEDG procedure, Document 2.

During the pressuring phase of the soiling step the rotors are turned manually.

The reference pipe had a smaller diameter than the pump inlet because the pump did not achieved the necessary flow rate of 1.5 m/s in a 1,5” pipe. The cleaning conditions with a 1” pipe as reference are less effective and therefore the test is more critical.

5. Results

The in-place cleanability tests were conducted three times on one test object. The individual results of the tests are comparable with each other. The applied gaskets of the circumferential piston pump showed no antimicrobial properties.

In table 1 the %-yellow discolourations of the test object and reference pipe is summarized.

Table 1: Survey of the test results

test object	**% yellow discolouration**		
circumferential piston pump, type ZS series	Test 1	Test 2	Test 3
inlet	purple, 0 %	one yellow area on the pipe surface, approx. 17 %	two yellow area on the pipe surface, approx. 15 %
rotors	purple, 0 %	one yellow area on the outer side of one rotor, approx. 10 %	one yellow area on the inner side of one rotor, approx. 5 %
housing	purple, 0 %	one yellow area on the side, approx. 3 %	purple, 0 %
rear side of the housing	purple, 0 %	one yellow area on the side, approx. 4 %	purple, 0 %
cover with O-ring	purple, 0 %	purple, 0 %	purple, 0 %
rotor-retaining nuts	purple, 0 %	one yellow area on the area of the O-ring on one nut, approx. 10 %	purple, 0 %
rotating seals	purple, 0 %	purple, 0 %	on both sides, detection of yellow area around the O-ring on the rear side, approx. 50 %
outlet	purple, 0 %	purple, 0 %	purple, 0 %
reference pipe	6%	20%	16%

Figure 3 illustrate the location and intensity of yellow discoloration of the circumferential piston pump.

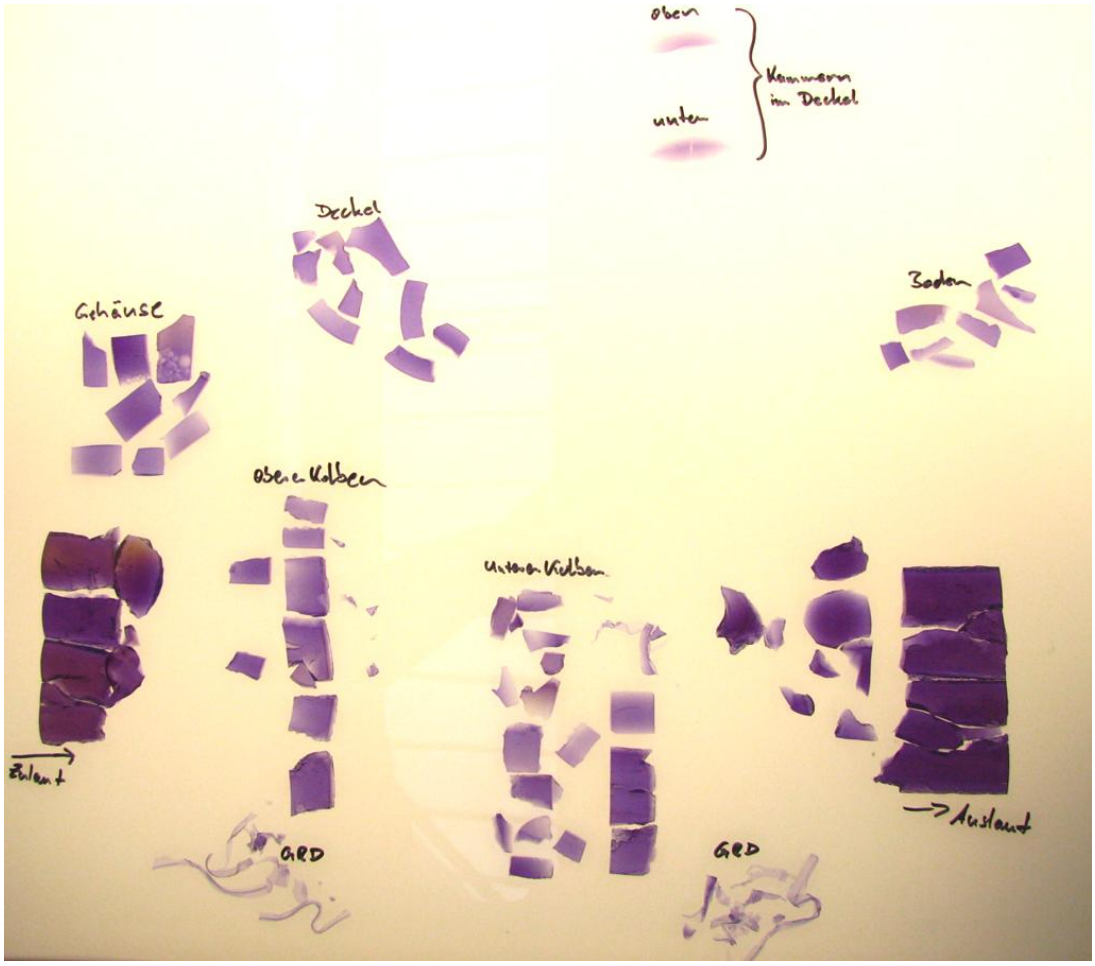


Figure 3: Agar result of the circumferent piston pump

6. Conclusions

The test result demonstrates that the wetted surfaces of the circumferential piston pump are easy to clean. The yellow discoloration is statistically distributed, so no poor hygienic design is located. The degree (%) of yellow discoloration is comparable to the reference pipe.

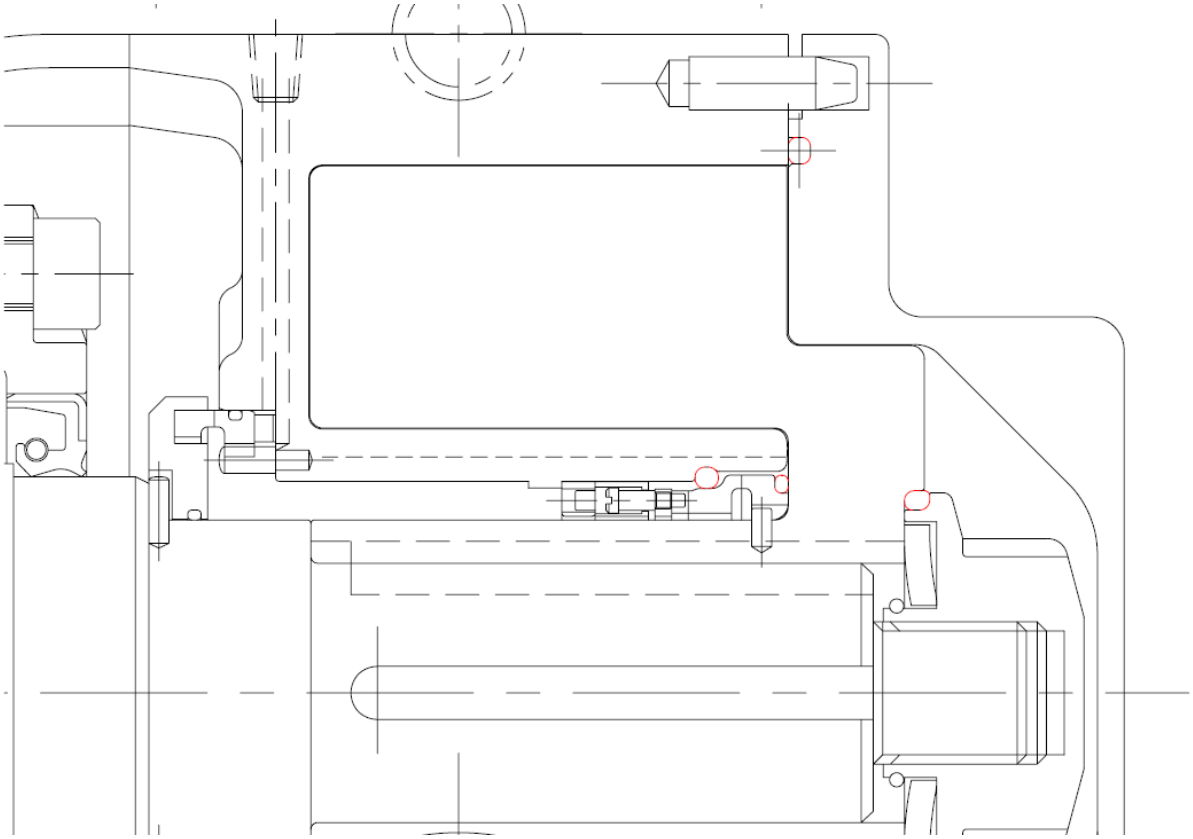
7. Records

Original data sheets, protocols and the final report will be filed in the archives of the Research Centre Weihenstephan for Brewing and Food Quality, Technische Univesität München in Weihenstephan, Germany for 10 years after completion of the study.

8. References

1. A method for the assessment of in-place cleanability of food processing equipment, EHEDG-Doc. 2, 3nd edition, 2004.
2. Hygienic equipment design criteria, EHEDG-Doc. 8, 2nd edition, 2004.
3. Hygienic design of closed equipment for the processing of liquid food, EHEDG-Doc.10, 1993.
4. Hygienic pipe couplings, EHEDG-Doc. 16, 1997.
5. Hygienic design of pumps, homogenisers and dampening devices, EHEDG-Doc. 17, 2002.

Appendix A



Appendix A: Drawing of the circumferential piston pump