Kegstar – A guide to keg cleaning

Introduction.

Kegstar UKI provides a 'fit to fill' container option to its customers. Below is a two-page overview of how Kegstar provide this service with the following pages providing more specific details on the cleaning and quality assurance program.

What is fit to fill?

(Kegstar definition) – A container that has been appropriately processed and cleansed to ensure that it is cleaned externally, sanitised internally with oxygen removed to a level below 50 part per billion.

How do we do this?

Cleaning Process

- External Visual Check
  - Any signs of impact damage (chime, neck, body of keg).
  - Spear connection is correct and level with the neck of the keg.
- External Cleaning
  - Jet wash to remove any stickers or foreign bodies from around the external body of the keg.
  - Jet wash to remove any foreign bodies in and around the recess of the valve.
- Internal Cleaning
  - Multistep cleaning process including hot water, caustic, acid and steam cleaning cycles. CO2 flushing and pressurization.
- Valve Sanitisation
  - Food grade sanitising spray used on external valve surfaces.
  - Keg dust cap placed over the top of the neck and valve.
- Presentation
  - Keg collar placed around neck
  - Kegs stacked onto pallet.
  - Pallet auto palletized to correct tensions with a top sheet used to enclose the pallet.

How do we check the process?

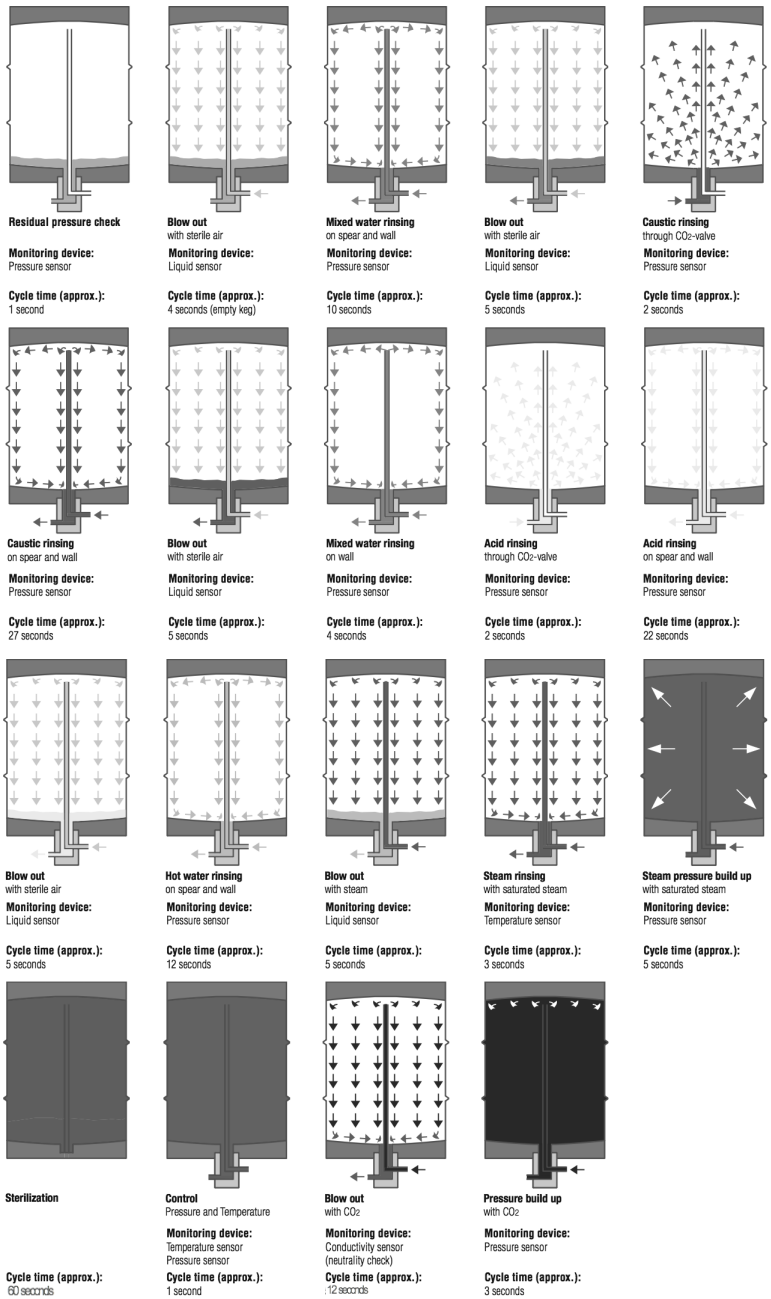
Quality assurance.

- Every keg
  - Cleaning cycle recorded (keg ID, date, time, hot water, caustic, acid and steam temperature).
- On start up
  - Titration check (manual chemical strength check) on cleaning solutions
  - Rotech keg run on every cleaning head and data analysed and stored
  - Dissolved oxygen level analysed and recorded from every head.
  - Physical condensate check – keg opened and visually inspected.
- On shut down
  - Titration check (manual chemical strength check) on cleaning solutions
  - Rotech keg run on every cleaning head and data analysed and stored
  - Dissolved oxygen level analysed and recorded from every head.
  - Physical condensate check – keg opened and visually inspected.

Kegstar

Kegstar Automated keg cleaning process (step by step)
(note acid wash is used once every 4 cycles)

Kegstar



Residual pressure check
Monitoring device: Pressure sensor
Cycle time (approx.): 1 second

Blow out with sterile air
Monitoring device: Liquid sensor
Cycle time (approx.): 4 seconds (empty keg)

Mixed water rinsing on spear and wall
Monitoring device: Pressure sensor
Cycle time (approx.): 10 seconds

Blow out with sterile air
Monitoring device: Liquid sensor
Cycle time (approx.): 5 seconds

Caustic rinsing through CO_2-valve
Monitoring device: Pressure sensor
Cycle time (approx.): 2 seconds

Caustic rinsing on spear and wall
Monitoring device: Pressure sensor
Cycle time (approx.): 27 seconds

Blow out with sterile air
Monitoring device: Liquid sensor
Cycle time (approx.): 5 seconds

Mixed water rinsing on wall
Monitoring device: Pressure sensor
Cycle time (approx.): 4 seconds

Acid rinsing through CO_2-valve
Monitoring device: Pressure sensor
Cycle time (approx.): 2 seconds

Acid rinsing on spear and wall
Monitoring device: Pressure sensor
Cycle time (approx.): 22 seconds

Blow out with sterile air
Monitoring device: Liquid sensor
Cycle time (approx.): 5 seconds

Hot water rinsing on spear and wall
Monitoring device: Pressure sensor
Cycle time (approx.): 12 seconds

Blow out with steam
Monitoring device: Liquid sensor
Cycle time (approx.): 5 seconds

Steam rinsing with saturated steam
Monitoring device: Temperature sensor
Cycle time (approx.): 3 seconds

Steam pressure build up with saturated steam
Monitoring device: Pressure sensor
Cycle time (approx.): 5 seconds

Sterilization
Cycle time (approx.): 60 seconds

Control Pressure and Temperature
Monitoring device: Temperature sensor, Pressure sensor
Cycle time (approx.): 1 second

Blow out with CO_2
Monitoring device: Conductivity sensor (neutrality check)
Cycle time (approx.): 12 seconds

Pressure build up with CO_2
Monitoring device: Pressure sensor
Cycle time (approx.): 3 seconds

Monitoring Devices in tank system

Temperature sensor (caustic, acid, hot water)
Conductivity sensor (caustic, acid)

The process in detail.

Visual Checks

Containers are visually inspected for any damage when received into the cleaning facility. Containers that are damaged (neck or chime damage) but repairable are removed from the standard cleaning process and enter a separate manual repair process. Any containers that have coloured container collars (usually red or yellow) are pulled out for review and inspection. A final visual check is conducted before the kegs are loaded into the internal cleaning process to check all debris has been removed and check that the container spear is correctly seated in the container. Any containers that fail these checks are removed from the process and enter in the manual repair process.

External Cleaning

Upon arrival at a Kegstar cleaning facility the containers are loaded into the external cleaning process. Containers are presented to the external cleaning process in an upright position and pressure washed to remove exterior dirty or labels attached to the keg body. Special attention is paid to the valve and neck area of the container. The keg is then turned upside down and the bottom of the container is also cleaned. Containers are processed this way to allow any wash water to drain out of the valve fitting recess.

Any labels that were not removed by the pressure washing process are pulled out of the line and labels are manually removed.

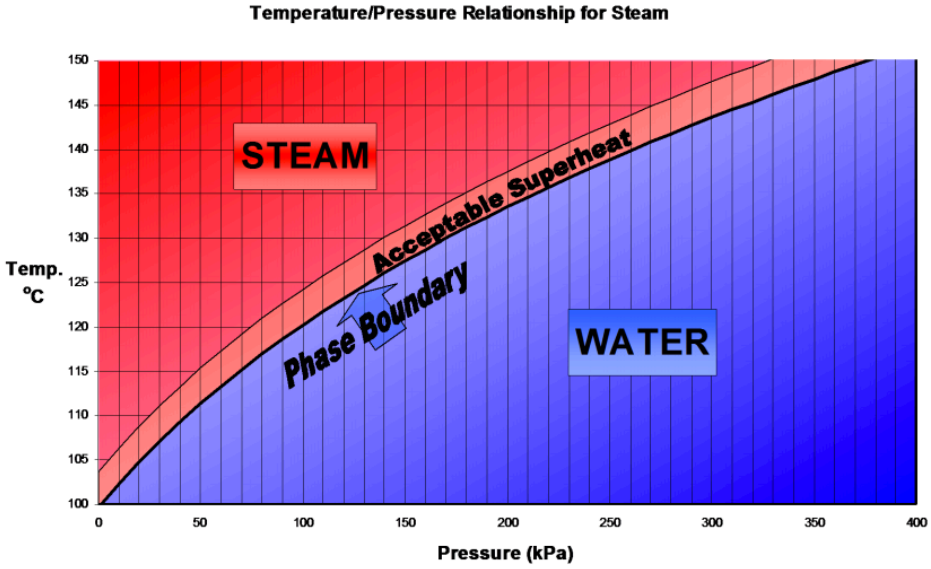
Internal Cleaning

Containers are loaded onto the cleaning machine and aligned with the cleaning heads. The correct program is selected for the container size (30l , 50l) and whether acid is to be used in the clean. The keg ID is entered and the machine is then started and runs through an automated process the steps of this program are detailed on the previous page's diagram.

It is vital that correct washing and saturated steam sanitizing are completed correctly and input media quality is maintained throughout. All steam, CO2 and compressed air inputs into the process pass through sterile filters to ensure that no bacteria or contaminants enter the system.

The cleaning chemicals used within the process are maintained at 80 degrees Celsius for caustic solution and 60 degrees Celsius for acid solution as per the chemical manufactures guidelines. The concentration of both solutions is maintained automatically through an auto dossing system which continuously monitors and maintains the correct concentration.

The steam sanitization process is run at temperatures between 130 – 135 degrees at a pressure of 1.9 bar.



After the steam sanitization, has been completed the steam is flushed out with high pressure CO2 before pressurization is completed to between 1.15 and 1.2 Bar pressure (this is the pressure at ambient temperature of approx. 15 degrees Celsius the pressurization is initially at approx. 2 Bar at heat and as the keg cools the pressure will drop to the desired 1.15 to 1.2 Bar).

All programs have several checks at various stages in the process. Checks include pressures, contents emptying, temperature and conductivity. If the process fails any of these checks the keg is rejected from the process and the operator is made aware with an error message. An automated record is made of every cleaning cycle, an example of this log is below.

Keg Id	Hot Water Temp	Caustic Temp	Acid Temp	Caustic Cond	Acid Cond	Steam Temp	Time string	MsgText
23474	78	81	12	10	0	133		19.12.2016 07:28:55

Upon successful completion of all steps of the selected program the keg is released and removed from the machine.

Valve Sanitising.

Sanitising spray is applied to the valve and a keg cap applied to ensure no dirt can get to the valve assembly.

Quality Assurance Equipment

Rotech Keg

The Rotech keg is an automated electronic measuring keg. Pressure, temperatures, flow rates and contents emptying are all measured and recorded. Rotech are industry leaders in the manufacturing of these instruments and are used by brewers around the world including most global brewing companies.

The Rotech keg is used to validate the continued operation within acceptable parameters.

Anton Paar OxyQC

Anton Paar produce high quality precision instruments for labourites and industrial use. The OxyQC is designed to measure the level of oxygen contained within other gases to a level of 1 parts per billion. The OxyQC requires a calibration check once a month. This is completed by flowing pure Nitrogen through the system to check the sensor quality. This calibrates the zero point of the O2 senor. This process meets the manufactures advice on calibration process.

Steam Boiler

Maintenance of the steam boiler and the water quality inputs are monitored and managed to ensure that the boiler operates efficiently and so that the steam produced is of the correct quality. The correct water treatment for the local water source is selected by a water treatment specialist to balance the local water input.

Quality assurance Process

Start of day process

Caustic Solution Concentration

Sample to be taken before cleaning machine is put into production, chemical analysis is used (titration check) to determine % alkalinity meets the chemical manufacturers recommendations.

Acid Solution Concentration

Sample to be taken before cleaning machine is put into production, chemical analysis is used (titration check) to determine % acidity meets the chemical manufacturers recommendations.

Rotech keg

To be used on each head.

Anton Paar

Keg from each head to be tested on Anton Paar machine. D.O

Condensate check

Keg from each head is opened and visually checked for the presence of residual condensate.

End of day process

The above process (start of day process) is repeated at the end of each day's production. In addition, a manual blow down of the boiler is conducted to ensure that any material built up during the day's operation is cleared from the boiler system.

Weekly Equipment Maintenance

Keg Cleaning Machine

Caustic and mixed water tanks are drained and re filled, chemical analysis to be used to determine % acidity and alkalinity.

Anton Paar

System check is undertaken with Nitrogen once per week to check the health check of the DO sensor.

Water Treatment For Boiler

Review water treatment chemical usage.

Monthly Equipment Maintenance

Anton Parr

Nitrogen purging once per month to check the sensor quality. This calibrates the zero point of the O2 senor. This meets the manufactures advice on calibration process.

Steam Boiler

Water treatment specialist visits site to validate treatment is performing as required and check equipment.

Records

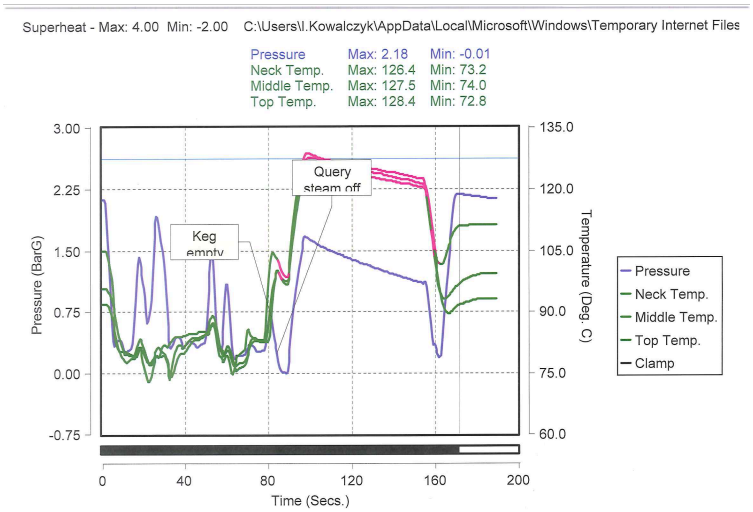
Keg Cleaning Records

Every keg cleaned has the data recorded. An ex ample of the data recorded is below.

Keg Id	Hot Water Temp	Caustic Temp	Acid Temp	Caustic Cond	Acid Cond	Steam Temp	Time string	MsgText
23474	78	81	12	10	0	133		19.12.2016 07:28:55

Rotech Keg Records

Data from Rotech Keg is recorded from every cleaning head on the machine twice daily. An example of the data contained within this extract is below.



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Dissolved Oxygen Records

Data from the Anton Paar OxyQC machine is recorded from every cleaning head on the machine twice daily. An example of the data contained within this extract is below.

Date	Time	Number	Method	Sample ID	O2	Temperature	Status O2	Container
					[ppb]	[C]		
01.12.2016	07:24:28	1	Standard	30L HEAD-1	2.9	10.2	OK	30ltr
01.12.2016	07:25:59	2	Standard	30L HEAD-2	7.3	10.3	OK	30ltr
01.12.2016	20:35:16	3	Standard	30L HEAD-2	3.1	10.4	OK	30ltr
01.12.2016	20:36:25	4	Standard	30L HEAD-1	2.8	10.4	OK	30ltr