



CONFIDENTIAL

## Keg Line Monitoring – Continuous recording of actual contents and filling/emptying rate

### Improve Operations - Save Utilities

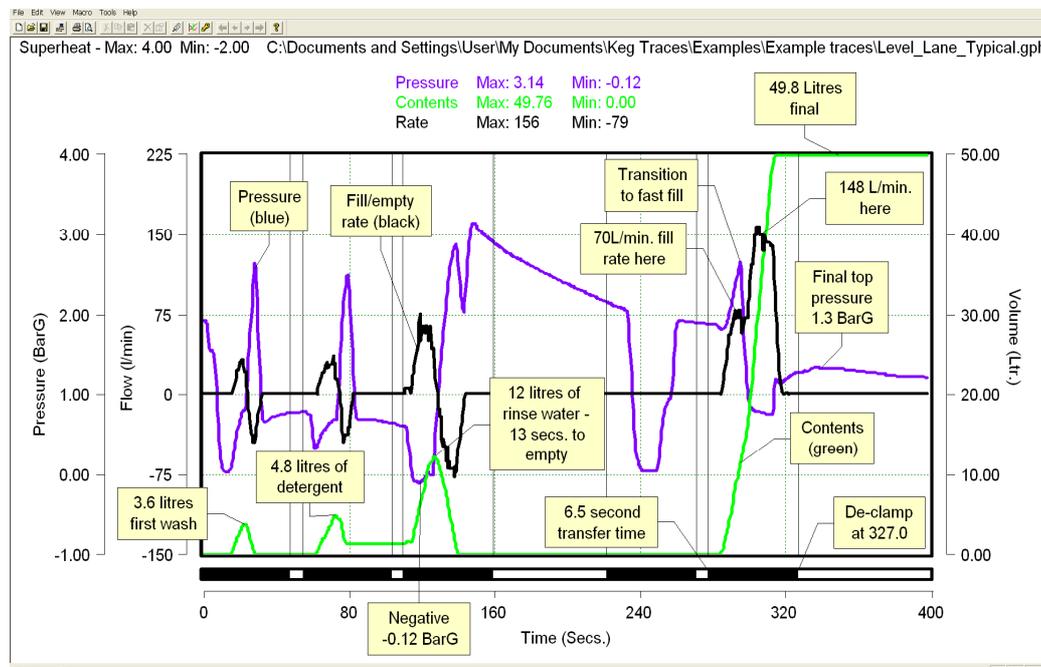
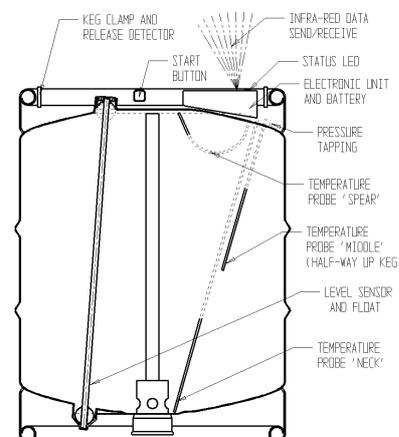
Level sensor records actual volume contents at any time, also rate of filling or emptying - litres or gallons (Imperial or US) per minute.

The diagram shows the arrangement of all the sensors in the Rotech Keg.

The level sensor is spaced away from the Barnes neck centre line to avoid fouling tapping heads, etc. Ask Rotech about fitting to kegs with diameter less than 220mm.

**Continuous actual contents measurement is new and unique in keg and racker monitoring.** For the first time, the brewery can see precisely and quantitatively how its kegs are being washed and filled.

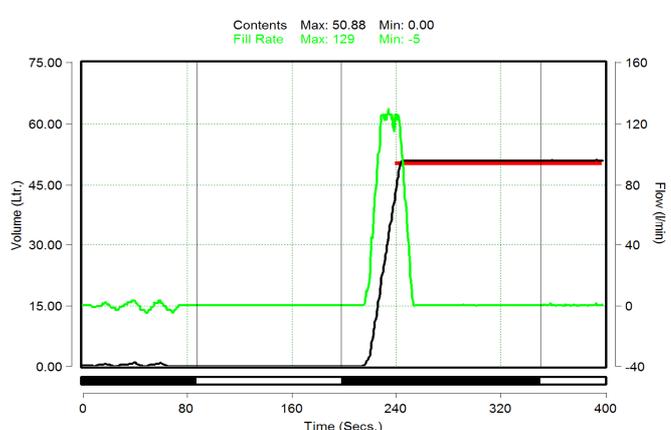
**Poor Practice:** The trace below is a recent example. For clarity, it shows only contents (black), fill rate (green), and pressure (blue) traces – other parameters have been temporarily hidden. Black and white bands along the time axis on the bottom show time on-head (black), and transferring between heads (white)



You can see that large pools of liquid build during washing, detergent, and rinse cycles.

However, best practice on this type of line is to run the keg as near empty as possible so that there is good hydrodynamic washing of all keg surfaces and valves.

The trace also shows slight under-filling in a 50-litre keg. The level sensor is not intended as a precision volume measure (e.g. for excise or other), however it will very quickly show if kegs are being under- or over-filled.



**Good practice:** Compare with the trace (left). For clarity, only volume (black), and rate (green) are shown.

The wash, detergent, and rinse cycles are run with negligible liquid volumes in the keg (3 small 'bumps' on Head 1) – this is best practice.

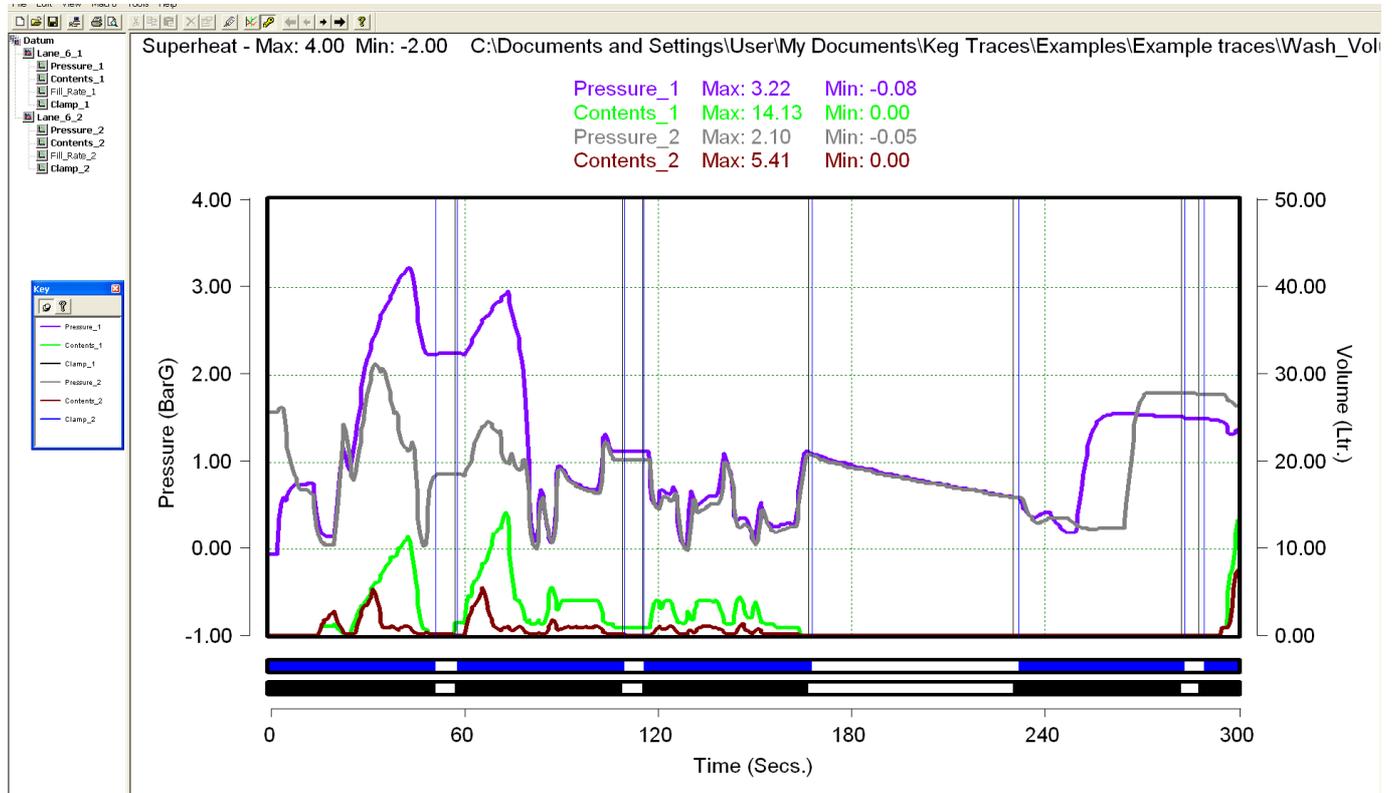
The fill profile is more-or-less constant – i.e. it builds rapidly to 120 l/min (26 gal./min.), and falls rapidly at the end; with slight over-filling in a 50-litre keg.

These traces show the complete wash and fill process. You can zoom in on any section to analyse in more detail, also show or hide pressure and temperatures.



## Analyse, Improve Operations, Save Utilities

This trace shows pressure and volume (litres) on the wash heads of a lane-type filler. Two runs – 'before' and 'after' - are superimposed to highlight the effect of changes. Temperatures have been hidden to avoid screen clutter.



'Before' pressure is blue, contents green. Pressure after adjustments is grey, contents brown.

Individual heads are shown by bands along the time axis on the bottom - black is 'before', blue is after changes.

It can be seen that before adjustment, large pools of detergent were building up during the wash cycles - up to 11, 14, and 4 litres respectively on Heads 1, 2 and 3 (the green trace). These frustrate good hydrodynamic washing of the lower walls and bottom dome; take a long time to empty, and consume a lot of air and sterile air – shown by the high pressures in the keg.

After attention to the recovery lines etc., the pools have been substantially reduced - to 5, 5, and 1 litre respectively on Heads 1, 2 and 3 - and further improvements are possible.

Factory air and sterile air consumptions have also been reduced significantly – from around 210 down to 170 Bar litres on Head 1, and from around 195 down to 120 Bar litres on Head 2.