



GUIDANCE NOTE – GN 12

Dearation in Hot Water Services Systems



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DEAERATION IN HOT WATER SERVICES SYSTEMS

Written By B Barlow

COMPILED BY THE TECHNICAL SUB-COMMITTEE OF THE
CSA

J Coppin, R J Oughton, P Davey, C Davey, C Shearer,
D Corner, D Cocksedge, M Todd, A Lucas

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9 Kings Court
Harwood Road
Horsham
West Sussex
RH13 5UR
Tel: 01403 754133
Website: www.csa.org.uk

| Revision | Detail | Date |
|--------------------|----------------|-----------------|
| Revision 00 | Updated | Jan 2015 |
| Revision 01 | Updated | Mar 2017 |

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Commissioning Specialists Association

July 2016

DEAERATION OF HOT WATER SYSTEMS

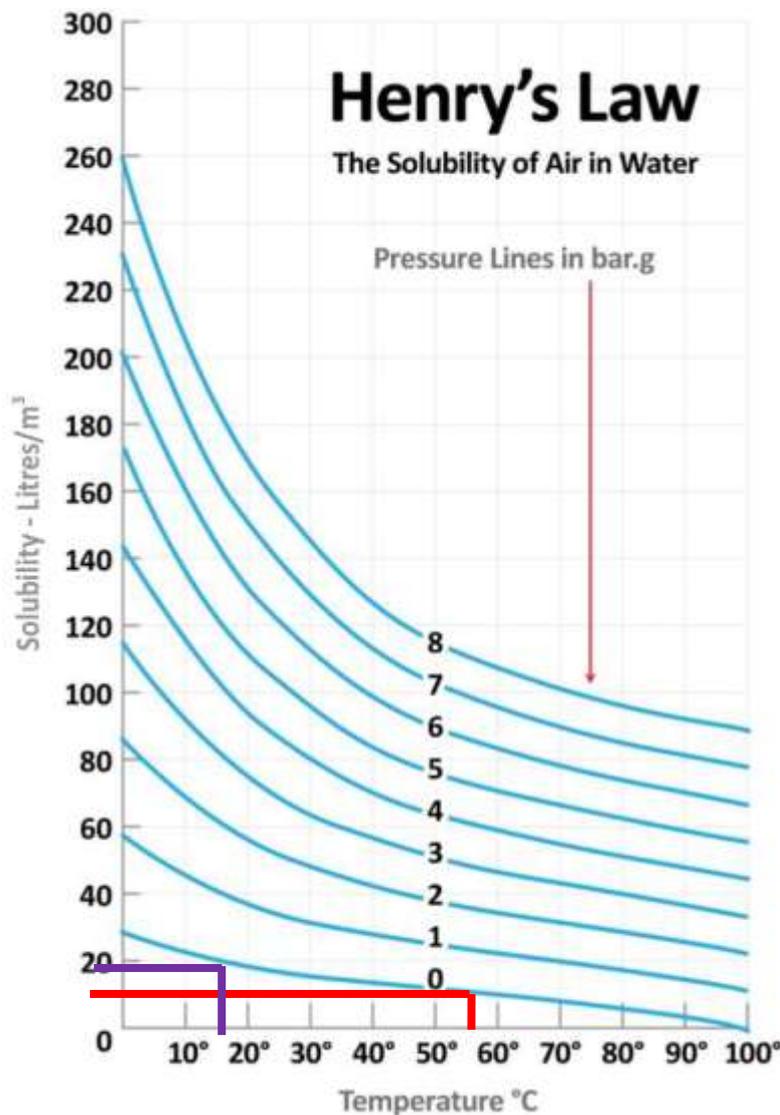
Problems

Hot Water systems can suffer from air related problems to a greater or lesser extent usually by a stuttering flow of water at taps or showers before a steady normal flow is experienced after air pockets have been discharged through outlets.

Reason

When water is drawn off water heaters, at 65°C, it is automatically replaced with make-up water at around 20°C maximum. Therefore, there is a temperature increase of approximately 40°C.

During the warming up process, in open vented systems [unpressurised], air will be released in accordance with Henry's Law of Absorption of Gasses in Liquids as [Fig 1]:-



[Fig 1]

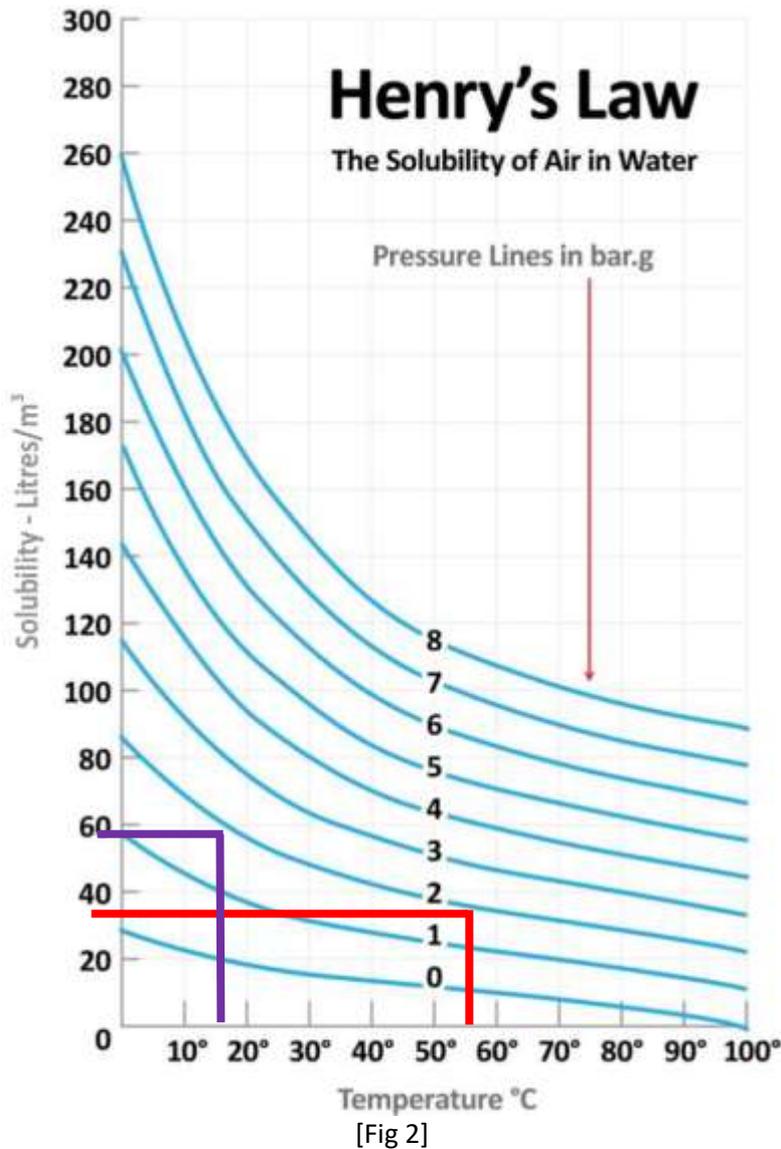
At atmospheric pressure, a cubic metre of water at 20°C contains 18.26litres of air in solution. —

At atmospheric pressure, a cubic metre of water at 60°C contains 9.72litres of air in solution. —

Therefore, for every cubic metre of water, 8.54litres of air is released in the water heater.

Any air not vented from the water heater will be entrained into the system, potentially creating air pockets.

With pressurised hot water systems, at say 2bar.g., Henry's Graph [Fig 2] demonstrates:-



At 2bar.g. pressure, a cubic metre of water at 20°C contains 55.66litres of air in solution. —

At 2bar.g. pressure, a cubic metre of water at 60°C contains 34.12litres of air in solution. —

Therefore, for every cubic metre of water, 21.54litres of air is released in the water heater. Any air not vented from the water heater will be entrained into the system, potentially creating air pockets.

Design

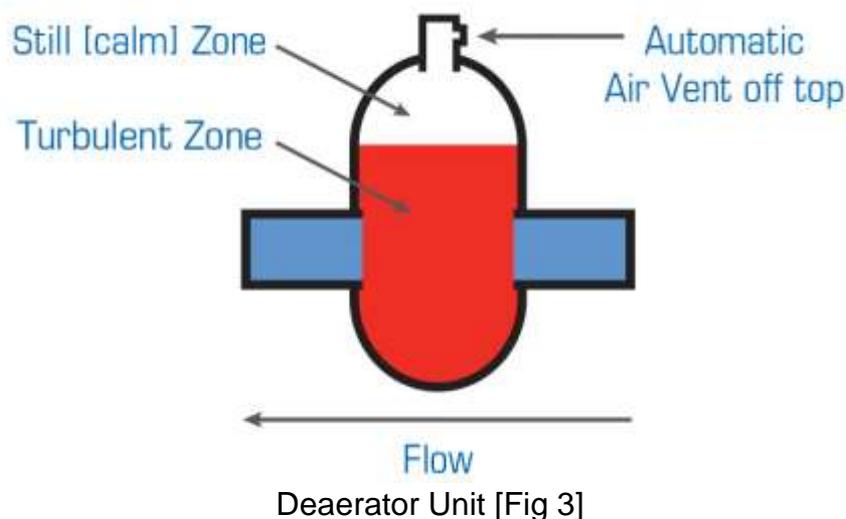
In unpressurised hot water services systems an open vent is provided to allow the air released to automatically vent to atmosphere. This open vent [continuously rising] should discharge over the cold water cistern [tank].

In pressurised hot water services systems an automatic air vent is normally provided as the solution to removal of released air from the system. However, an automatic air vent does not function effectively when air/water is in circulation so can only release a small proportion of air, with the greater proportion of released air passing through into the system.

Alternative Solution

A Deaerator should be installed at the hottest point of the system, which is on the flow pipe from the Water Heater, and should always be the bore of the flow pipe.

The Deaerator functions by creating a laminar no flow zone [still water zone] away from the flowpath of the water passing through the unit, see Fig 3. The still water zone allows the created air bubbles to rise and vent to atmosphere naturally through the automatic air vent, so starving the water of air nearest where the air is created.



For a Deaerator to function effectively, there must be a pumped return main back the water heater.