

HSM ENGINEERING TECHNOLOGY LTD
VISUAL INDICATOR AIR PURITY MONITOR
RELATIVE HUMIDITY VS. ATMOSPHERIC DEW POINT
CALIBRATION AT 27C (80 F) FILTRATION TEMPERATURE
RECORDED AT BLUE DIVING 17 May 2006

Relative Humidity (RH) %	Back Pressure Reg set: 124 Bar (1800psi) °C (°F)	Back Pressure Reg set: 207 Bar (3000psi) °C (°F)
10	-54C (-65F)	-57C (-70F)
20	-48C (-55F)	-51C (-59F)
30	-44C (-48F)	-47C (-52F)
40	-42C (-43F)	-44C (-48F)
60	-38C (-36F)	-41C (-41F)

The relative humidity monitor uses a small 2cm diameter humidity element indicator "Pie" card fitted inside a high pressure 414 barg housing with a visual view port to indicate the gas stream "condition" in real time, prior to dispensing into a divers cylinder or storage bank. The humidity element card is divided into three equal "pie" sections each section marked 20, 40, 60 percent relative humidity and printed "Lavender indicates humidity". (alternative card is 10, 20, 30 percent) During compressor operations the ability of the filter material (molecular sieve) to absorb water vapour is reduced by the amount of water the chemical absorbs. The card indicates this reduction in filter life by indicating the increasing presence of water in the gas stream by a change of colour to the normally blue sections changing to lavender (pink) as each relative humidity R.H. section is reached.

Assumptions

1. Pressure maintaining valve set at 124 Barg (1800 psig) or is increased to 207 Barg (3000 psig)
2. Temperature measured in filter stack after final separator (ambient temperature was approx. 21°C (71°F))
3. Water vapor pressure enhancement factor was applied to the above calculation.
4. Note UK air purity standard BS EN 12021 **requires** a dew point drier than -51°C or (-60°F) 25mg/m³

Reasons to maintain low dew point at all times.

1. Dry air keeps corrosion, bacterial, and mold growth to a minimum in steel SCUBA cylinders and storage banks, especially corrosion in those pressure vessels made of steel.
2. Note diving with high pressure 300 bar cylinders requires very dry air with low dew points to prevent regulator free flows in cold water. A ten percent RH should humidity element should be used for cold water diving and maintain air drier than -48°C or (-55°F) or 35 mg/m³ at all times as stated in BS EN 12021.
3. A triple display thermometer should be fitted to the room adjacent the filter with a probe into the compressor house to monitor ambient temperature of both the compressor and the filter housing with a high and low memory. This temperature is critical to calibrate the filter chemical life or hour run between cartridge changes.
4. The visual indicator should be used as a guide for filter replacement. When the relevant humidity reaches the indicator it will change colour from blue showing a normal (dry gas) to pink (wet gas).

Critical Important Note

HSM calibrated the R.H. Chart above on the actual measured compressor and at a room temperature of 27°C any increase in either compressor, filter temperature or room temperature will increase the gas temperature in the filter, further reducing filter life and decreasing the ability of the filter chemical to absorb water vapour.