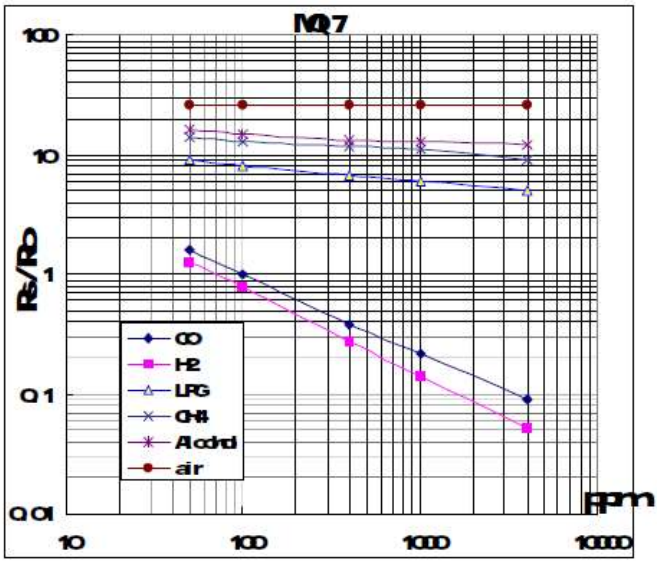
CONSTRUCTION OF CARBON MONOXIDE CONCENTRATION INDICATOR-II

Akshay Srivastava (Department of Chemical Engineering, Manipal University Jaipur)

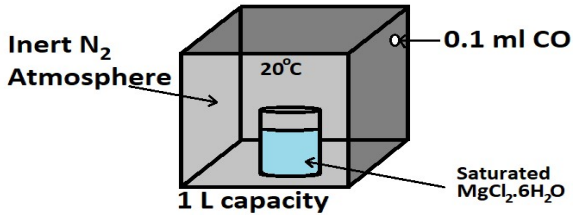
CALIBRATION OF THE MQ-7 FOR PPM READING

Requirement for calibration: MQ-7 is constructed to provide analogue values (ranging between 0-1023) varying proportionally with increasing concentration of CO in ambient air. Since the sensor does not come pre-calibrated, the conversion these values to PPM requires a proper calibration procedure in controlled conditions. The resistances of the sensor in (i). a 0ppm environment, R_0 and (ii). A 100ppm environment (33%RH and 20°C), R_S of Carbon Monoxide are measured. Since the sensor has proportionally varying R_S/R_0 ratio with the concentration of CO in the environment, the changing surface resistance of the sensor is utilized in order to determine the CO concentration in ppm.



Sensitivity characteristic of MQ-7 from the datasheet

Though the working principle is simplistic, the procedure is relatively complex. For accurate measurement of the concentrations of CO, the sensor needs to "warm-up" to a certain temperature and it is stated in the datasheet that "the minimal pre-heating time of the MQ-7 is 48 hours" and that an additional voltage is required so as to serve as a source for the "mini-heater" built into the MQ-7 for the said warm up. Furthermore, it is faintly stated in the datasheet that the sensor needs an external and addition load resistance which appears in the relation between the R_S/R_0 ratio and the source voltage. Moreover, for the calibration conditions as close to 33% RH, 20°C and 100ppm concentration CO have to be maintained in a chamber. This can be done as schematically shown in the following diagram:



An inert atmosphere of N_2 is maintained in a confined space of 1L. Into this, 0.1 ml of CO is introduced into the setup. Within this set, Magnesium Chloride Hexahydrates (as in the research paper attached in the mail) are placed so as to maintain a relative humidity of about 33% at 20˚C. With these basic conditions established, the MQ-7 sensor can be calibrated in this setup (this is a basic design made just to explain the concept of construction of the chamber, certain factors such as the volume of the hydrates, the sensor and etc. hence are not yet considered).