

## EntryRAE Duty Cycling

### Introduction

The EntryRAE is a low-cost 5-gas monitor designed for simple operation and ease of maintenance. The PID in the EntryRAE has a somewhat different design than in most other RAE PIDs that is intended to reduce the need to clean the sensor and lamp. The PID lamp, sensor and lamp electrodes are combined into a single unit that is discarded at the end of its working life rather than servicing the individual parts.

One feature that has reduced the cleaning requirements is the use of a pump duty cycle. In this patented technique, the pump is switched off for several seconds and then back on to resume measurement. During the pump's off time, the PID lamp remains on to generate ozone and "burn off" heavy contaminants that may build up on the lamp and sensor. This technical note summarizes the effect of duty cycle on the performance of the PID and the other sensors in the EntryRAE.

### Benefit of Duty Cycle for PID Measurements

Figure 1 shows the response of the EntryRAE PID run continuously for over two weeks in a simulated work environment and tested periodically with 100 ppm isobutylene. After a few days without duty cycling, the response drops significantly and sensor would need recalibration and cleaning. However, with 50% duty cycling, the PID remains within an acceptable 10% error after one week, and after two weeks could be recalibrated without the need for cleaning.

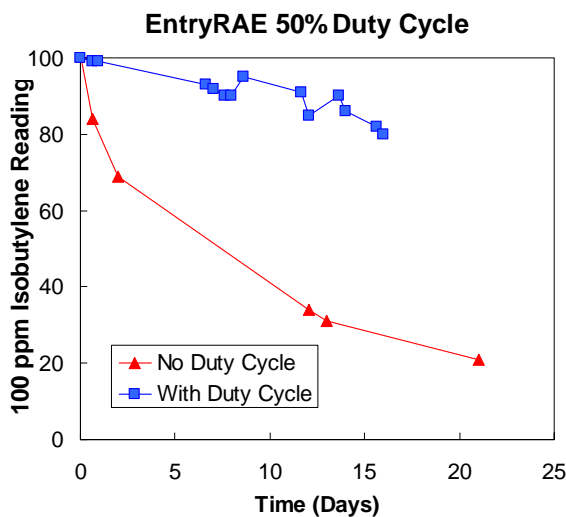


Figure 1. Effect of duty cycling on PID stability in the EntryRAE.

### Varying the Duty Cycle

The default duty cycle in the EntryRAE is set at 50%, causing the pump to turn on and off about every 7 seconds. However, the pump runs continuously when the unit detects a PID reading over 3 ppm, CO over 5 ppm, H<sub>2</sub>S over 3 ppm, LEL over 3%, or O<sub>2</sub> outside the range 19.5 - 22.5%. It is possible to run continuously for 5 minutes by holding down the Y/+ and N/- keys simultaneously for a few seconds. After 5 minutes the EntryRAE automatically reverts back to duty cycling. Using the ProRAE Studio software, the 5-minute time can be increased to up to 99 minutes, or the duty cycling can be disabled completely for continuous operation. The shortest duty cycle of 50% gives the most lamp self-cleaning and thus the best sensor stability over the long term. The duty cycle should be turned off only where rapid response is crucial to the measurements.

### Effect of Duty Cycling on Other Sensors

There is sometimes concern that the duty cycling affects the response time of the other four sensors in the EntryRAE. However, the 8-second duty cycle does not have much effect because these sensors have response times of 15 to 35 seconds, which requires about one minute for a stable response. This is because the cycle is relatively short compared to the sensor response time and because the gas can still equilibrate with the sensor somewhat while the pump is off. Also, as noted above, as soon as a significant response is measured, the pump stays on continuously, so that duty cycling is not operative during critical measurement time.