

Yeast Flatulence or Eructation (CO₂): What Are the Effects and How to Control It

Q: Any idea why the mean CO₂ levels rose significantly in two of the three tasks after the control methods and equipment were implemented?

A: Air sampling for CO₂ was done at different days and times before and after the control measures were implemented. Control measures for the Barrel Filling task focused on reducing biomechanical stress, and no controls were implemented for CO₂ levels. The cellar task rose because during the testing after the extraction system was installed, more fermenter evacuations took place than when the initial pre-control levels were measured.

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Q: You mentioned NASA having looked at CO₂ health effects at the beginning, but I do not think OSHA was mentioned at all. Are there any OSHA standards specific to CO₂ or that relate to brewing operations?

A: The OSHA specific exposure standard (Permissible Exposure Limit) for CO₂ is 5000 PPM, 8-hour time-weighted average.

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Q: How many breweries of each group (small, medium, large) were involved in the study? Were these all Michigan breweries?

A: These were all Michigan breweries. Three breweries participated in the study. One brewery was selected for each category small, medium, and large.

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Q: Can you comment on how increasing fatigue affects injury rates?

A: Fatigue due to high heart rates from biomechanical stress, workload, and CO₂ exposure will cause several issues with brewers. First, they will be more susceptible to strain, sprain, and over-exertion injuries with fatigue muscles. They will make more errors in judgment that will increase the risk of an injury occurring. Lastly, it will increase brewer's stress that can also lead to injuries.

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Q: Did you look into or know of critical injuries or death at breweries due to CO2-related accidents?

A: The cases I know about stem from an employee complaint on CO2 exposure health effects from an AB brewery in Houston. That led to an OSHA investigation and fines of \$88,000 for exceeding the permissible exposure limit. In 2013, seven brewery workers died in a fermenter at Grupo-Modelo. It is believed that the cause was CO2 exposure.

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Q: Can you expand a bit more on how you used the REBA charts to assess the ergonomics of a task, for example, the barrel filling apparatus?

A: REBA scores were obtained by watching brewers performing the tasks on videotape. Each job task was scored according to the angles and weights observed in the videotape. One investigator scored all the job tasks before and after the controls were implemented.

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Q: Some small breweries use a shop vac to evacuate CO2 from fermenters before cleaning with caustic. Is this an effective way to reduce CO2 from a fermentation vessel?

A: It depends. A shop vac that is exhausted to the outside of the brewery would be an effective extraction method in reducing CO2 levels in a small brewery. If the exhausting the shop vac inside the brewery, we have just moved the CO2 from one location to another.