

# Abstract

## Study of standard ventilation in rubber manufacturing process

### Objectives

Rubber production process gives rise to hazardous environment because the rubber and various chemicals used as a raw material react and generate gas, rubber fumes, odors, etc.

According to the rule 422 on Occupational Safety and Health Standards, sources of hazardous materials(gas, vapor, dust) should be inside a sealed facility or local exhaust ventilation should be installed. But it does not provide a form of local exhaust and exhaust flow rate for each equipment characteristics. It suggests control velocity only which is difficult to apply directly in field.

Therefore, the purpose of this study is to create a standard ventilation system that is easily accessible.

### Methods

In this study, to use as the basis for the standard ventilation study, the local exhaust ventilation system is installed in the field and its performance is evaluated by collecting relevant data. Also, model experiments and computational fluid dynamics simulation were carried out as required to develop a reasonable performance test.

## Results

### (1) Blowers and Air Purification Device Management Practices

Visit to the Rubber manufacturing company (Tires, Tubes, Packing) involved measurement of the total of 49 local exhaust ventilation systems. Blower efficiency measurements(flow rate ratio) showed that for 57% of the cases the efficiency decreased to less than 60%. In this case, 43% of the blowers were found to be aging and lacking in maintenance. Overall investigation shows regular maintenance of local exhaust ventilation is urgently required.

### (2) Standard ventilation plan for each process

Production processes of the rubber has diverse pollutant generation points. Typical pollutants (rubber fumes, odors, high temperature, etc) are generated from refining, rolling, extrusion, vulcanization, and checking process. For finding standard ventilation, field research were carried out in the individual process. The design data for computational fluid dynamics are derive through domestic and international research literature reviews.

## Conclusions

Several design conditions were tested to find the effective and economic alternative for the successful local exhaust ventilation. The proposed standard ventilation plan and operational regulation is expected to help local exhaust design of the relevant companies.

**Key words** rubber manufacturing, refining, rolling, extrusion, vulcanization, standard ventilation