

## The Relationship Between Indoor Air Quality And Sick Building Syndrome (Sbs) In Oil Gas Refinery

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### ABSTRACT

The sick building syndrome comprises of various nonspecific symptoms that occur in the occupants of a building. It is commonly increases sickness absenteeism and causes a decrease in productivity of the workers. Evidence suggests that what is called the Sick Building Syndrome are at least three separate entities, which has at least one cause. The following are some of the factors that might be primarily responsible for Sick Building Syndrome such as : Chemical contaminants, Biological contaminants, Inadequate ventilation and Electromagnetic radiation. In many cases it is due to insufficient maintenance of the HVAC (heating, ventilation, air conditioning) system in the building. As this syndrome is increasingly becoming a major occupational hazard. It was used the analytic cross-sectional design. Based on data obtained 80% of respondents reported significant ongoing health problems in the eyes, head, and the nose. 60% had bad symptoms in the throat, the stomach and cough, 50% had gastrointestinal disorders, 40% fatigue and 25% occurred all symptoms sick building syndrome. The 40 respondents were recruited to the study, with a mean age of 35 years (range 20-55). To support the evidence of Sick Building Syndrome, further checks are needed for some of the factors in next research. Measurement of Chemical contaminants, Biological contaminants, Inadequate ventilation & Electromagnetic radiation.

**Keyword** : indoor air pollution, sick building syndrome, occupational health

## **INTRODUCTION**

The sick building syndrome comprises of various nonspecific symptoms that occur in the occupants of a building. This feeling of ill health increases sickness absenteeism and causes a decrease in productivity of the workers. It is commonly accepted to represent eye, nose, and throat irritation, headaches, lethargy, difficulty concentrating, and sometimes dizziness, nausea, chest tightness, and other symptoms. Evidence suggests that what is called the SBS is at least three separate entities, each of which has at least one cause. It is a multi factorial event which may include Chemical contaminants, Biological contaminants, Inadequate ventilation and

Electromagnetic radiation. In many cases it is due to insufficient maintenance of the HVAC (heating, ventilation, air conditioning) system in the building. As this syndrome is increasingly becoming a major occupational hazard, the cause, management and prevention of this condition will summarize the Relationship between indoor air quality with sick building syndrome in Operation center Building.

## **METHODS**

A quantitative methodology was used, namely through the analytic cross-sectional design, site visits to measure air quality and collect questionnaire from the workers in the same time.

Fig 1: Map of Location

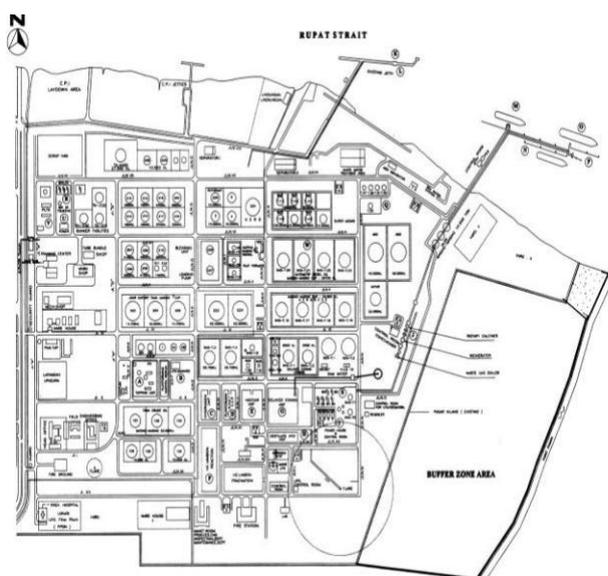
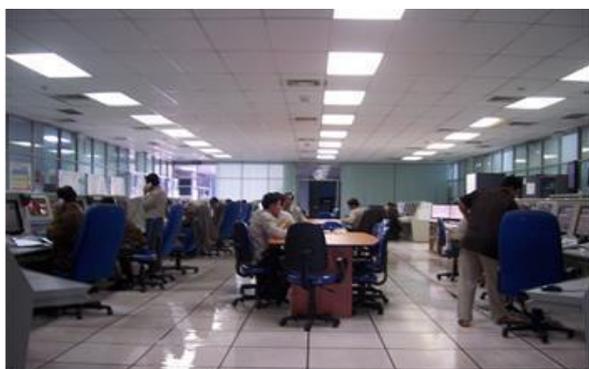


Fig 2: Control room



there were 10 cases or 25% occurred sick building syndrome (> 4 symptoms). 80% of respondents reported significant ongoing health problems in the eyes, head, and the nose. 60% had bad symptoms in the throat, the stomach and cough, 50% had gastrointestinal disorders, and 40% with fatigue.

Table 1: Data of Symtoms SBS

| Symptom                    | SBS<br>(10 people) |    |
|----------------------------|--------------------|----|
|                            | f                  | %  |
| eye                        | 8                  | 80 |
| Head                       | 8                  | 80 |
| symptom on temperature     | 8                  | 80 |
| throat                     | 6                  | 60 |
| nose                       | 8                  | 80 |
| gastrointestinal disorders | 5                  | 50 |
| stomach                    | 6                  | 60 |
| fatigue                    | 4                  | 40 |
| cough                      | 6                  | 60 |

**RESULTS AND DISCUSSION**

The result are temperature 14°C < TLV's 18°C, Dust 124,46 µg/m < PEL 150 µg/m, humidity 40%-60% normal, Air velocity 0,15 – 0,25 m/s < TLV. 40 respondents were recruited to the study, with a mean age of 35 years (range 20-55). 17/40 (42,5%) were male. Diagnoses were varied and representative of the population. Based on data obtained from 40 respondents

Table 2: Data of Indoor air Quality

| Variable     | Room I |        |        | Room II |        |        |
|--------------|--------|--------|--------|---------|--------|--------|
|              | North  | South  | Mean   | North   | South  | Mean   |
| Dust         | 117.96 | 130.95 | 124.46 | 103.87  | 105.47 | 104.64 |
| Temperature  | 20     | 22     | 21     | 16      | 18     | 17     |
| humidity     | 43     | 45     | 44     | 40      | 43     | 42     |
| Air velocity | 0.21   | 0.25   | 0.23   | 0.21    | 0.23   | 0.22   |

Table 3: Data Age of Respondent

| No             | Age   | Room |    | Totally | %     |
|----------------|-------|------|----|---------|-------|
|                |       | I    | II |         |       |
| 1              | 20-30 | 1    | 5  | 6       | 15 %  |
| 2              | 31-40 | 2    | 20 | 22      | 55 %  |
| 3              | 41-55 | 2    | 10 | 12      | 30 %  |
| <b>Totally</b> |       | 5    | 35 | 40      | 100 % |

**CONCLUSION(S)**

This pilot study is limited by the small sample size. Based on the results of the study can be drawn the conclusion that the quality of the air with 4 parameters (temperature, humidity, velocity of air and dust levels) on the oil gas refinery still below the threshold minimum value. In such circumstances, the case of sick building syndrome (SBS) in the oil gas refinery occurred as many as 10 people or 25% occurred sick building syndrome , so it concluded there is a relationship between air quality pollution with sick building syndrome (SBS). Further research is required to answer all the health problem of sick building syndrome and the impact to such workers by taking more samples in order to test the strength of better . Indoor air Quality had important roles in facing various serious occupational health issues in areas affected by the environmental contamination. It is suggested that maintaining air quality in the building.

Table 4: Relationship between Temperature & SBS

| Location             | Tem No | Case |      | SBS Case |    | Total y |     | p Value |
|----------------------|--------|------|------|----------|----|---------|-----|---------|
|                      |        | f    | %    | f        | %  | f       | %   |         |
|                      |        | °C   |      |          |    |         |     |         |
| <b>Room I North</b>  | 20     | 3    | 7,5  | 0        | 0  | 3       | 100 | 0,217   |
| <b>Room I South</b>  | 22     | 2    | 5    | 0        | 0  | 2       | 100 |         |
| <b>Room II North</b> | 16     | 8    | 20   | 6        | 15 | 14      | 100 |         |
| <b>Room II South</b> | 18     | 17   | 42,5 | 4        | 10 | 21      | 100 |         |
| <b>Jumlah</b>        |        | 30   | 75   | 10       | 25 | 40      | 100 |         |

Table 5: Relationship between Humidity & SBS

| Location             | Humidity (%) | No Case of SBS |      | SBS Case |    | Totally |     | p Value |
|----------------------|--------------|----------------|------|----------|----|---------|-----|---------|
|                      |              | f              | %    | f        | %  | f       | %   |         |
|                      |              |                |      |          |    |         |     |         |
| <b>Room I North</b>  | 43           | 3              | 7,5  | 0        | 0  | 3       | 100 | 0,250   |
| <b>Room I South</b>  | 45           | 2              | 5    | 0        | 0  | 2       | 100 |         |
| <b>Room II North</b> | 40           | 8              | 20   | 6        | 15 | 14      | 100 |         |
| <b>Room II South</b> | 43           | 17             | 42,5 | 4        | 10 | 21      | 100 |         |
| <b>Totally</b>       |              |                |      | 10       | 25 | 40      | 100 |         |

**Table 6:** Relationship between Air velocity & SBS

| Location       | Air velocity<br>(m/dtk) | No Case of SBS |    | SBS Case |   | Totally |    | p Value |
|----------------|-------------------------|----------------|----|----------|---|---------|----|---------|
|                |                         | %              | f  | %        | f | %       | f  |         |
| Room I         | North                   | 0.12           | 10 | 100      | 0 | 0       | 10 | 0.120   |
|                | South                   | 0.18           | 9  | 100      | 0 | 0       | 9  |         |
| Room II        | North                   | 0.21           | 7  | 70       | 3 | 30      | 10 |         |
|                | South                   | 0.25           | 9  | 81       | 8 | 2       | 11 |         |
| <b>Totally</b> |                         |                | 35 | 5        | 5 | 5       | 40 | 0       |

**Table 7:** Relationship between Dust & SBS

| Location       | Dust (g/m) | No Case of SBS |    | SBS Case |   | Totally |    | p Value |
|----------------|------------|----------------|----|----------|---|---------|----|---------|
|                |            | f              | %  | f        | % | f       | %  |         |
| Room I         | North      | 117.96         | 10 | 0        | 0 | 0       | 10 | 0.120   |
|                | South      | 130.95         | 9  | 0        | 0 | 0       | 9  |         |
| Room II        | North      | 103.87         | 7  | 70       | 3 | 30      | 10 |         |
|                | South      | 105.40         | 9  | 81       | 8 | 2       | 11 |         |
| <b>Totally</b> |            |                | 35 | 5        | 5 | 5       | 40 | 0       |

Fig 3: Oil & gas Refinery



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### ETHICAL APPROVAL

In process. Pilot studies like the present are usually required prior to applications involving non-invasive methodologies

### COMPETING INTEREST

The authors declare that We have no competing interest.

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