

# **SMART**

## **JOURNAL OF BUSINESS MANAGEMENT STUDIES**

**(An International Serial of Scientific Management and Advanced Research Trust)**

---

**Vol.4**

**No. 1**

**January - June 2008**

---

**ISSN 0973 - 1598**

**Chief Editor**  
**Dr. M. SELVAM, M.Com., Ph.D.,**  
**Bharathidasan University,**  
**India**



**SCIENTIFIC MANAGEMENT AND ADVANCED RESEARCH TRUST**  
**(SMART)**

***TIRUCHIRAPPALLI (INDIA)***

**<http://www.geocities.com/smartbard>**

# EFFECT OF WORK PLACE POLLUTION ON THE HEALTH OF THE CEMENT FACTORY WORKERS – A CASE STUDY

**A.Marimuthu**

Lecturer in Economics, Madurai Kamaraj University College, Aundipatti ,Theni (Dt), Tamilnadu,India.

## **Abstract**

*The present investigation explores the impact of the work place environment on the health of workers in a cement factory in Virudhunagar District of Tamilnadu. While manufacturing cement, the emission of dust particles immediately and constantly affects the workers' breathing, leading to loss in mandays, thereby reducing the productivity of labour. The present study has drawn samples from staff and workers within the factory. Among these two categories (395), 150 workers were selected by simple random sampling technique. Data collected with the help of standardized tools revealed that 38%, 28% and 25% suffered breathing problem, asthma and allergy respectively. Further, it is inferred that there is a positive and significant correlation between service of the workers and medical expenses (0.5117), number of days suffered by diseases (0.6147) and number of days suffered by nuisance (0.5056). Results revealed significant effect on the workers working in the cement factory and the health problems of the workers.*

## **Introduction**

One of the most serious threats faced today by mankind is the pollution of our environment. In fact, most of the developed countries have already realized the fact that the very existence of life on the earth may be endangered if suitable steps are not taken for prevention, control and abatement of environmental pollution. This is why industrialized and developed nations are spending large amounts of money to control the environmental pollution. The developing countries are beginning to follow their example within the constraints imposed by the limited financial resources and scarcity of trained man power.

## **Problem Focused**

Cement industry is a major source of pollution. It is a major energy consumer, that is, all the cement units need to use a little over five percent of all energy sources. Making of a ton of cement would require about 2.5 tonnes of raw materials, intermediate products and solid fuels. Cement kiln dust emanating from cement factories is a mixture of calcium, potassium, aluminium, sodium and silica oxides.

Cement factory is one such source of particulate air pollutants, emitting large quantities of cement kiln dust into the atmosphere. Generation of dust from a cement factory is mainly through rotary kiln, coal mill and cement crushers. Majority of the kiln dust is emitted through the chimney at the top of the stack if there is no proper emission control device.

Even with heat saving methods, about 100-110kg of coal and flame temperature over 1500<sup>0</sup>c would be needed per ton of cement. Depending on the process employed and the degree of sophistication, manufacture of one kg of cement would give rise to some times 14m<sup>3</sup> of exhaust air and gas and 35 percent of raw materials would be driven away as carbon and water vapor. These quantities of air and gas have to be cleaned before being discharged into atmosphere.

Most of the cement units in India use coal as fuel and coal is a highly polluting fuel. The main problem with the Indian cement factories is that they did not adopt proper pollution prevention process. They generated more than 600 gram of dust per cubic meter of air.

While manufacturing cement, the emission of dust particles immediately and constantly affects the residents residing in the vicinity of factories, affecting even breathing. It affects the health of people and reduces their life expectancy rate. It leads to loss of mandays, thereby reducing the productivity of labour.

This paper attempts to present the results of a research study carried out during 1999-2000, on a cement industry located in Ramasamy Raja Nagar of Virudhunagar District of Tamil Nadu. So far no serious and scientific investigations have been carried out on the environmental and economic problems of Madras Cements Limited located in Ramasamy Raja Nagar of Virudhanagar district of Tamil Nadu. The available literature on the study of economic impact of dust pollution of cement industry like Madras Cements Limited is very scanty. Therefore, the present study is an attempt to fill this gap in order to analyse the economic impact of cement dust pollution on workers.

### **The Objectives**

- To study the environmental impact of cement dust pollution on the health of workers of the cement factory and to examine the man days lost and medical expenses.
- To study the inter-relation between services, health hazards and medical expenses.

### **Hypotheses**

- Medical expenses are in no way related to the years of service of the workers in Madras Cements Limited.
- Service and number of days suffered by diseases are not related.
- Medical expenses are not related to the number of days lost on account of disease.
- Years of service and number of days suffered by nuisance are not related.
- Private treatment is not associated with the medical expenses, the number of days lost by disease and nuisance.

### **The Methodology**

It is understood that the impact of cement dust pollution is causing concern not only in the neighborhood of the factory but also in the surrounding areas / villages within a radius of five to ten Kms. The man power in the Madras Cement Limited at Ramasamy Raja Nagar is classified into 3 categories, namely, Executives, Staff and Workers in the factory, mining and in marketing. The total is 745.

Out of this, 445 are working in the factory. Out of this, 50 executives are not included in the study because they are not affected by the dust pollution because they live away from the factory or within the factory in non-polluting sophisticated rooms.

Hence, the present study has drawn samples only from staff and workers within the polluting side of the factory. Among these two categories (395), 150 are selected by simple random sampling technique. This forms 37.98% of the total number of staff and workers working within the factory.

### **Tools for Analysis**

The correlation coefficient has been used for identifying the relationship between the services and medical expenses, services and number of days suffered by diseases, and medical expenses for diseases, services and number of days suffered by nuisance and private treatment of the workers under the study. The ANOVA has been used to discover the change in the medical expenses between working section and category of workers.

### **Results and Discussion**

It is inferred from **Table-1**, that there is a positive and significant correlation among the variables, namely, services and medical expenses (0.5117), number of days suffered by disease (0.6147) and number of days suffered by nuisance (0.5056). It shows that any change in the services causes change in other variables,

namely, medical expenses, number of days suffered by disease and nuisance in the same direction.

Further, the results reject null hypotheses, namely, medical expenses is in no way related to the services of the workers of the cement factory and number of days suffered by disease are unrelated to service and number of days suffered by nuisance. Hence, it is concluded that medical expenses, number of days suffered and nuisance are associated with the services of workers in the Madras Cements Limited.

Further, the computed correlation coefficient between the number of days suffered by disease and medical expense (0.6546) is positive. Hence, the null-hypothesis is rejected and it is concluded that there is a correlation between medical expenses and number of days suffered by disease.

The correlation coefficient between the variables, namely, medical expenses, number of days suffered by diseases and nuisance and private treatment are statistically significant and positive. It shows that any increase in this variable causes increase in the same direction of private treatment. Hence, the stated null-hypothesis is also rejected. Thus, it is concluded that the private treatment is highly dependent on medical treatment of workers and number of days suffered by disease and nuisance.

To test the significance of difference in medical expenses for disease between working section and category of the workers, two-way ANOVA test was carried out.

It is observed from **Table- 2** that there is a significant variation in the medical expenses for diseases between working sections of workers (2.491) and category (skilled, semi skilled and unskilled) of workers (3.885). The two interactions effect between groups and between workers is also significant.

The two way ANOVA test was carried out to test the null – hypothesis that there is no

significant variation in medical expenses for nuisance between working section and category of workers. The computed results are given in **Table -3**.

The results of two way analysis of variance test revealed that the observed F-value (1.697) was not significant for workers between working sections. It indicates that there is no significant variation in the medical expenses for nuisance between workers in different working sections in the Madras Cements Limited, Ramasamy Raja Nagar. Further, the observed 'F' value (6.100) was found to be significant for workers between different categories. It implies that there is a significant variation in the medical expenses for nuisance between workers in different categories.

But the two-way interaction effect between working section and categories of workers is found to be significant (5.013) at 5 percent level. It implies that workers working in different sections and categories have caused variations in the medical expenses for nuisance. Hence, the null-hypothesis does not hold good. Thus, it is concluded that different categories and sections of workers have contributed to variations with medical expenses for nuisance in the study area.

### **Findings of the Study**

It is inferred that out of 150 workers, the number of workers affected by asthma, allergy, tuberculosis, bronchitis, heart problem, skin disease, breathing problem, digestion problem and eye irritation are 28,25,10,5,11,4,38,2 and 2 respectively.

It is inferred that there is a positive and significant correlation among the variables, namely, services and medical expense (0.5117), number of days suffered by disease (0.6147) and number of days suffered by nuisance (0.5056). It shows that any change in the service causes changes in other variables, namely, medical expenses, number of days suffered by disease and nuisance in the same direction.

Further, the computed correlation coefficient between the number of days suffered by disease and medical expenses is positive (0.6546). Hence it is concluded that there is a correlation between medical expenses and number of days suffered by disease. The ANOVA test showed that there is a significant variation in the medical expenses for diseases between working sections and the categories of workers (skilled, semi-skilled and unskilled). The interaction effect between groups and between workers is also significant.

The results of two-way ANOVA revealed that the observed 'F' value (1.697) was not significant for workers between sections. It indicates that there is no significant variation in the medical expenses for nuisance between the workers in different working sections and in different categories. Further, the observed 'F' value (6.100) was found to be significant for workers between different categories. It implies that there is a significant variation in the medical expenses for nuisance between workers in different categories.

The two-way interaction between working sections and categories of workers is found to be significant (5.013) at 5 percent level. It implies that workers working in different sections and categories have caused the variations in the medical expenses for nuisance. Thus, it is concluded that different categories and sections of workers have contributed to variations with medical expenses for nuisance in the Madras Cements Limited, Ramasamy Raja Nagar.

### **Suggestion**

- The Madras Cements Limited, Ramasamy Raja Nagar provided Rs.25.96 per worker per month as dust allowance. This amount should be spent for the purpose for which the amount was given. Hence, it is the responsibility of the workers to safeguard

their health. Hence, steps should be taken by the government and the factory to educate the workers and advise them to undergo periodical medical check up. This will reduce the health problems. Further, various Departments of the State and Central Government, Employees, Trade Unions and the Voluntary Organizations should organize seminars, conferences, workshops and such other activities for the workers to raise the awareness of the impact of cement dust pollution so that they can undergo periodical medical treatment.

- The experiences of many industrial countries prove that a tall chimney or stack is the best answer to control air pollution problems. Hence, it is suggested that the height of the stack of the Madras Cements Limited is to be further raised.
- The researcher observed that the maintenance cost of the pollution control equipments like electrostatic precipitators and bag filters was higher than the installation charges of these equipments. Therefore, many a time these pollution control equipments are kept idle. Hence, the government should bear the maintenance cost of the above said equipments for the benefit of society.

### **Conclusion**

To conclude, being a highly profit - oriented industry, it must have social and moral responsibility to produce the product in a clean manner and to follow the strict environmental standards prescribed by the government. This voluntarism is the only way to overcome all kinds of environmental problems. If the present study has done a little to draw the concerted attention of the big tycoons of the cement factory and the officials concerned, to the needs of keeping the factory area and surroundings pollution free as much as possible, the purpose of this research work would have been amply fulfilled.

## References

1. S.K.Tandon, Shashi Khandelwal, V.K.Jain and S.J.S.Flora, (1984), "Unary Excretion of Heavy metals in cement workers", *Indian Journal of Environmental Health*, Vol.26, No.3, 181-186.
2. M.H.Abubecker, (1990), "**Socio-Economic Impact of pollution**" – A study of Cement Factories in Tiruchirapalli District in Tamilnadu". Published Ph.D Thesis submitted to Bharathidhasan University, Trichy.
3. V.Gopal, M.Umamaheswari and P.R.Balasubramanian, (1997), "Effect of Cement dust on Ambient Air Quality and on Blood Cytogenetic change in Human – A case study of Cement Industry Workers". *Journal of Ecotoxicology and Environmental Monitoring*, Vol. 7, No.1, January, 17-27
4. Madhoolika Agarwal and Najma Khanam, (1997), "Variations in Concentration of Particulate matter around a Cement Factory," *Indian Journal of Environmental Health*, Vol.39, No.2, 97-102.
5. J.K.Sinha, (1986), "Effect of Particulate Pollution on workers and its control", *Indian Journal of Environmental Protection*, Vol.6, No.2, April, 98-104.
6. K.Nagender Rao, (1997), "Green Productivity: The case of Cement Industry", *Productivity*, Vol.37, No.4, Jan – Mar, 611-620.
7. A.Marimuthu, (2002), "**A Study of the Economic Impact of Dust Pollution by Madras Cements Limited in Virudhunagar District of Tamilnadu**", Unpublished Ph.D., Thesis Submitted to Madurai Kamaraj University, Madurai.

**Table - 1**  
**Correlation Matrix Between Inter-related Variables of Occupational Diseases and Nuisance**

Variables	Years of Services (1)	Medical Expenses (2)	No. of days Suffered by Diseases (3)	No. of days Suffered by Nuisance (4)	Private Treatments (5)
Year of Service (1)	--				
Medical Expenses (2)	0.5117*	--			
No. of days Suffered by Diseases (3)	0.6147*	0.6546*	--		
No. of days Suffered by Nuisance (4)	0.5056*	0.1042	0.1712	--	
Private Treatment (5)	0.1481	0.6068*	0.5147*	0.5461*	--

\* Indicates the correlation co-efficients are significant at 5 per cent level.

**Table - 2**  
**Analysis of Variance of Medical Expenses for Disease between Working Section**  
**and Category of the Workers**

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	Significant of F
Between working section (X <sub>4</sub> )	5	36418510.614	7283702.123	2.491	S
Between Category	2	22714857.095	11357428.548	3.885	S
Between working section and category	9	83411018.551	9267890.950	3.170	S
Explained	16	132304807.569	8269050.473	2.828	S
Residual	133	388862153.931	2923775.593	-	-
Total	149	521164961.500	3497764.842	-	-

S – Significant at 5 per cent level.

**Table - 3**  
**Analysis of Variance of Medical Expenses for Nuisance between Working Section**  
**and Category of the Workers**

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	Significant of F
Between working section (X <sub>4</sub> )	5	1096132.551	219226.510	1.697	NS
Between working Category (X <sub>5</sub> )	2	1576271.672	788135.836	6.100	S
X <sub>4</sub> -X <sub>5</sub>	9	5829363.032	647707.004	5.013	S
Explained	16	7721460.577	482591.286	3.735	S
Residual	133	17182710.256	129193.310	-	-
Total	149	24904170.833	167142.086	-	-

NS – Not Significant, S – Significant at 5 per cent level