

Evaluation of Clean Air from Viewpoint of Tile Industry Personnel

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ABSTRACT

The purpose of this study was to determine evaluation of clean air from viewpoint of tile industry personnel at two pressing workplaces, in order to utilize the results for economic policy making of air pollution control.

Total dust was measured on the basis of NIOSH Method 0500, showing dust concentration of 59.26 ± 15.81 mg/m³ and 32.16 ± 9.85 mg/m³ in the mentioned workplaces.

The value of clean air was determined, using Contingent Evaluation Method from the viewpoint of 100 workers (50 workers in each workplace) as case group, and 100 administrative personnel as control group.

The results demonstrated that, the average payments by workers are 77500 and 16700 Rials per person monthly in the case and control groups respectively.

The workers were exposed to 3 options as: discount in payment of insurance premium and tax, causing an increase in partnership monthly payment in the case group: 39% and 55% respectively, and in the control group equivalent to 20% and 36% respectively. It is worth mentioning that, to pay loan to the workers did not indicate any significant difference between case and control groups partnerships.

Key words: Dust, Contingent Evaluation Method, Willing To Pay (WTP)

INTRODUCTION

An individual normally requires 22.65 kg/24 hours air while he/she consumes food 1.5kg/24 hours. In other words, the consumed air within 24 hours is 15-20 times more than the consumed food. Since the air is available in a large quantity for every body, attention is not paid to its necessity and valuation. While, in the current century, human activities have threatened the quality of the available fresh air to human beings causing the modern societies be encountered with air pollution problems (7). The side effects of the activities are in such a way that old and new economic concepts/rules have been under question. Therefore, authorities have changed their traditional mentality regarding that natural sources are free. At present, the concept of development is integrated with protection of the environment and natural resources.

Negotiation on influential factors over air pollution has been one of the most effective research trends in the environment economic management and planning (2).

With regard to policy making on environmental matters, it is very important to know that, which factors have direct or indirect effects on WTP (willing to pay) (2). Thus, this study was conducted to identify the range of WTP of the personnel, working in a tile industry at west of Tehran. Besides, with regard to the general conditions of Iran, the effects of three choices, including discount on insurance premium, decrease of income tax and loan receipt on range of WTP were examined.

MATERIALS and METHODS

The present study was carried out in 2 stages:

A: study on personnel payment

The WTP among 100 workers in the pressing workplaces Nos. 1 and 2 (case group) and in 100 staff of administrative department (control group) were studied.

Contingent Evaluation Method was employed in order to estimate relative value of clean air and motivation of workers for participation in air pollution control. Data collected through personal interview and completing an appropriate questionnaire including 10 questions.

Through the questionnaire, personnel were asked whether or not they are ready to participate in the air pollution control and pay some money. Next, the personnel were offered some discounts in payment of insurance premium and tax as well as payment of long term loan in order to attract their willing to participate in the air pollution control.

B. determination of dust concentration

Dust concentrations in pressing workplaces were measured on the basis of the method No. 0500 recommended by NIOSH (5). OSHA and HSE (4) have also recommended similar methods. Environmental sampling was performed using SKC pumps, Model 224- PCX R3, PVC filter, 5 μ pore size in 37 mm cassette filter holder.

The filters were placed in laboratory atmosphere for 24 hours before and after the sampling stage, so that, they could be

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adapted with laboratory medium (9). Weighing was done by a calibrated sensitive balance model Kern, Germany, with accuracy of 0.1 mg (10^{-5} g). The pumps were calibrated every day before and after sampling stage by soap bubble meter. Some samples were taken as control, (one sample / 20 environmental samples) besides of environmental samples (10). Then, the area of workplaces 1 and 2 was calculated and divided into 3 × 3 square meter. Thus, workplaces Nos. 1 and 2 were divided into 150 and 200 sections, respectively. Then, each part coded separately and finally 18 and 22 sites were chosen in workplaces No.1 and 2 respectively (with 95% confidence limit) for taking air samples. During air sampling, temperature and pressure were controlled for correcting the measured air volumes in terms of the standard conditions.

RESUTLS

A. results relating to the dust concentration
 Mean value of total dust concentration in the workplaces Nos. 1 and 2 with their standard deviation are indicated in table 1. As the results show, dust concentration was more than threshold limit value in the both pressing workplaces. Moreover, there was a significant difference between dust concentration in two workplaces as the concentration in workplace No. 1 was significantly more than that of workplace No. 2 (P<0.05).
 B. results regarding the WTP.

Ranges of participation of case and control groups to pay for the air pollution control and the way of their partnership have been presented in table 2. In addition, the reasons for not to participate in payment for air pollution control have been indicated in table 2 for both control and case groups. The choices including discount on payment of insurance premium, tax, and payment of loan were studied in the case and control groups. The results have been illustrated in tables (3), (4), and (5) in that order.

Table 1. Results of dust concentration in pressing workplaces

Workplaces	Concentration	Threshold limit value (mg/m3)
	Mean ± SD	
1	59.26 ± 32.16	10
2	15.81± 9.85	

Table 2. Frequency distribution of the studied groups on the basis of participation to control air pollution.

Process	Number	Participation						Non – Participation							
		Once a life		Monthly		Annually		Not able to pay		Duty of employer		Duty of government		Not care	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Work place no.1	50	2	4	19	38	13	26	3	6	4	8	2	4	7	14
Work place no.2	50	2	4	7	14	11	22	9	18	6	12	6	12	9	18
Total	100	4	4	26	26	24	24	12	12	10	10	8	8	16	16
Control	100	0	0	24	24	0	0	5	5	30	30	23	23	18	18

Table 3. Frequency distribution of personnel participation in decrease of air pollution with regard to the discount on Insurance premium

Process	Number	Once a life		Monthly		Annually		NWTP	
		N	%	N	%	N	%	N	%
Work place No. 1	50	0	0	41	82	5	10	4	8
Work place No. 2	50	3	6	34	68	10	20	3	6
Total	100	3	3	34	68	10	20	3	6
Control	100	0	0	79	79	0	0	21	21

NWTP: Not Willing To Payment

Table 4. Frequency distribution of personnel participation in decrease of air pollution with regard to the discount in tax

Process	Number	Once a life		Monthly		Annually		NWTP	
		N	%	N	%	N	%	N	%
Work place No. 1	50	0	0	37	74	5	10	8	16
Work place No. 2	50	2	4	21	42	9	18	18	36
Total	100	2	2	58	58	14	14	26	26
Control	100	0	0	59	59	1	1	40	40

NWTP: Not Willing To Payment

Table 5. Frequency distribution of personnel participation in decrease of air pollution with regards to the payment of loan

Process	Number	Once a life		Monthly		Annually		NWTP	
		N	%	N	%	N	%	N	%
Work place No. 1	50	0	0	29	58	3	6	18	36
Work place No. 2	50	0	0	26	52	0	0	24	48
Total	100	0	0	55	55	3	3	42	42
Control	100	0	0	17	17	0	0	83	83

DISCUSSION

The results of environmental sampling in both pressing workplaces demonstrated that, dust concentration in workplace No. 1 was 59.26 mg/m³ (approximately 6 times more than threshold limit value) and in workplace No.2 was 32.16 mg/m³. The main factors, causing the dust concentration in workplace No.1 to be more than workplace No.2 were as follows:

- The distance of machineries establishment in workplace No.2 was far from each other compared to those located at the workplace No.1.
- The machineries neither equipped with a suitable ventilation

nor with a special tank for collecting waste powder at the rear part of the machineries. Therefore, dust concentration in workplace No.1 was higher than workplace No. 2. It should be mentioned that, sampling was performed in summer, when, all doors and windows were held open and air conditioning system was on. So, it is obvious that, during winter, when all doors and windows are kept closed, the dust concentration is increased more than the range achieved in this research.

Willingness to Pay (WTP):

The WTP for the air pollution control and influential factors on it, were considered the most effective research trend in

environmental protection planning (8).

In fact, in developed countries, the WTP is an important legislative tool in connection with health affairs, particularly in the environmental health. In other words, WTP is one of the strongest proof in making the most effective environmental laws and regulations.

It is very important for environmental policy makers to know which factors have a direct or indirect effect on the range of WTP among small groups and on the total population of the society as well. So that, they can make macro-environmental policy (8).

Moreover, the high range of WTP is a factor in the developed societies to prevent air pollution (1). In other words, the higher the range of WTP, the higher development of the societies.

In determining range of WTP, individuals of the societies were asked, how much they were ready to pay for decreasing of air pollution followed by determination of minimum and maximum WTP. It is obvious that, the persons who were in direct contact to harmful materials, they shall have higher WTP in comparison with the persons, who were not in direct contact to such materials.

In connection to financial assistance of Sweden to UN (United Nation) to protect the South Pole environment, a study was performed on the basis of WTP and required decisions were made with regard to the results. The main question of this research was as follows:

“Are you ready to pay any amount for protection of South Pole environment?”(3)

With regard to importance of the mentioned case, it was decided to achieve the range of WTP of some Iranian workers and control group, on the basis of the question: “Are you ready to pay any amount for providing a clean air?” Then, with regard to economic conditions of Iran, three choices were studied in order to review the effects on the range of WTP.

Discount on insurance premium:

According to the Iranian relevant regulations, 30% of workers monthly salaries are paid to Social Security Fund (20% as insurance contribution of employer, 7% as contribution of worker and 3% as contribution of government). It should be noted that, the employees are subjected to social security fund regulations too. It was explained to the workers that, whether or not they agree with decreasing of their insurance contribution against financial assistance to the air pollution control projects.

Discount on income tax

The workers were asked if their income tax is decreased, will they be ready to support financially air pollution control projects.

Payment of long term loans:

The purpose was to study that whether it is possible to allocate some amounts of governmental budget for controlling of air pollution particularly in industries against deducting a little amount of the workers' salary within long term. It should be noted that, the maximum amount of the payment, should be less than monthly average of medical expenses of the personnel according to the data issued by Social Security Organization. The average expense of a patient, when he/she refers to the physician for one time, is 14600 Rials including the drugs expenses, thus, maximum of deduction should not be more than

29200 Rials.

Before asking the worker's WTP to the control of air pollution, they were asked whether or not they are satisfied with their workplace conditions. The results showed that, 62% of workers of the production line No.1 and 52% of production line No.2 were not satisfied from their workplace conditions. So, it is clear that, the dust concentration in production line No.1 was higher than production line No. 2, i.e. $59.26 \pm 15.81 \text{ mg/m}^3$ versus $32.16 \pm 9.85 \text{ mg/m}^3$. It seems that, the high concentration of dust has been caused the workers dissatisfaction.

In general, in the both production lines, 57% of the workers were dissatisfied from their workplace conditions, while, this range in the control group was 10%. So, it was expected that, the range of WTP in the case group should be more than control group, confirmed by the results. On the whole, 54% of workers declared that, they are ready to pay for controlling of the air pollution. However, in control group, only 24% declared their WTP for the purpose. According to the results, range of WTP for the case and control groups was achieved as follows:

The average to the WTP for the case group (workers): 77500 Rials.

The average of the WTP for the control group (employees): 16700 Rials.

With regard to the mentioned conclusions, the difference between the minimum and maximum WTP is 60,800 Rials. According to the research performed by Alberini and his colleagues in Taiwan, the minimum range of WTP in Taiwan was 7.61\$ and maximum 28.07(1).

Tolley performed a research on range of WTP in the USA (8). The range of WTP was 40.32\$, whereas, Louhman and his colleagues study found a range of 19.23 for WTP in 1979 (4).

According to the present study, it is assumed that, population of Iran is 60,000,000 and value of non-polluted air is calculated in one month or within any other periods. For example, maximum value of non-polluted air in Iran is 4.65×10^{12} and minimum value is 1.002×10^{12} . In other words, the study population expect that minimum 12000 Rials and maximum 55800 Rials have been considered for air pollution control per year.

So, expectation of people should be considered by the related authorities in the policy and budget makings. Then, the reasons for unwillingness of the people who are not ready to pay for controlling of air pollution were studied. It was identified that, 12% of the workers were not able to pay for control of air pollution, 10% believed that, it is the duty of the employer, 8% considered that, it is the duty of the government and 16% did not care about the air pollution.

According to the results, the reasons that the control group did not want to pay, were as follows:

5% were not financially able to pay, 30% believed that it was the duty of the employer, 23% believed that it was the duty of the government, and 18% did not care about the air pollution.

It seems that, the main reason for not to pay is that, they believe it is the duty of the employer and government.

By discussing on discount of insurance premium, tax, and accordingly increase of the personnel motivation, the range of WTP was changed. The number of personnel for the case and control groups who agreed to pay were increased to 72% and to

22.9% respectively.

Range of WTP in the case and control groups were 79800 Rials and 18000 Rials respectively. In other words, the range of the maximum and minimum WTP were approximately increased 3% and 7.7% regarding to the basic range.

The advantage of discount on income tax attracted willingness more than discount on insurance premium. Range of WTP in the case and control groups was approximately increased to 82500 Rials and 19700 Rials respectively. According to the results, the personnel did not show their interest in paying long term loan, accordingly the range of WTP showed a decrease with respect to the basic WTP. The range of WTP in the case and control groups was approximately 58300 Rials and 16400 Rials. Accordingly a decrease of 32.9% and 1.8% observed, in that order.

CONCLUSION

Findings indicated that, the payment of long term loans was not an attractive way to the willingness to pay, so, it is not applicable approach while, making discount on insurance premium and income tax can be considered as a suitable way of dealing with the problems of the air pollution in industries.

According to the results, the government must allocate some financial support to the personnel insurance contribution and income tax for the air pollution control. Otherwise, employers should be responsible for providing financial support of air pollution control protects. In order to determine the exact payment as well as offer welfare allowances, further studies are required to be conducted.

However, the government should accept the whole responsibilities in this respect and try to encourage employers or rule out the serious laws and regulations, by which, the employers to be obliged to keep their workplace as much clean environment as possible.

Acknowledgment:

The valuable assistance of Dr. Pour -Reza in editing this paper is highly appreciated.

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