

# **Current Environmental Pollution at Asbestos-Cement Roofing Tile Production Factories in Vietnam and its Health Risks to the Workers**

**Dang Dinh Tri, Nguy Ngoc Toan and Nguyen The Cong**  
*Vietnam National Institute of Labour Protection*

## **1. Introduction**

Occupational safety & health (OSH) and environmental protection are important issues, which have been paid great attention by the Government of Vietnam in its socio-economic development strategy. Being a developing country, Vietnam is facing a lot of problems as a result of conflict between economic development and environmental protection and public health – workers' health in particular.

For the past 10 years, many industries have developed rapidly, including the asbestos-cement roofing tile industry. Development of the asbestos-cement roofing tile industry has rapidly met people's demands for roofing tiles, especially in mountain and coastline areas; on the other hand, due to the employers and employees having a poor understanding of the hazards of asbestos, the OSH issue has not received proper attention, leading to environmental pollution and a direct impact on workers' health.

In Vietnam, in the development of the asbestos-cement roofing tile industry there exist – as in other countries in the world – two contradictory points of view regarding asbestos use:

- to ban the use of all types of asbestos (including chrysotile) for roofing tile production.
- to continue to use chrysotile asbestos for roofing tile long-term production.

The latter view is in conflict with current socio-economic policy. After several discussions, the Government has allowed the controlled use of chrysotile asbestos for manufacturing roofing tiles combined with research on finding a substitute material in the near future.

The permission for the continuous use of chrysotile asbestos in asbestos-cement production has set for us – researchers at the NILP – a heavy task; that is, to enable the effective use of asbestos while ensuring OSH measures protect both workers' health and the environment.

At this forum, our presentation deals with current environmental pollution at asbestos-cement roofing tile production factories in Vietnam and the risk it poses to workers' health.

## **2. Situation on current environmental pollution at asbestos-cement roofing tile production factories in Vietnam**

Asbestos has been used in Vietnam for nearly 30 years, principally for manufacturing asbestos-cement roofing tiles. Vietnam has 17 asbestos mines, in which the asbestos reserves (about

160,000 tons) are too small and of not good enough quality to exploit. Asbestos, therefore, is mainly imported from Russia, Canada and China. About 95% (62,475 tons) of the total is imported for roofing tile production.

At present, there are 35 asbestos-cement roofing tile enterprises in Vietnam. Most of these were built in the period of 1995-2000, except for two enterprises located in the South of Vietnam built before 1975 and one 15 years ago. Vietnam has banned the building of new plants since 2001. The asbestos-cement roofing tile industry employs about 10,000 direct production workers and a lot of indirect workers who are employed for raw material supply or sale of products. That is why it is necessary and urgent to carry out OSH research at the asbestos-cement roofing tile enterprises.

Being a leading national institute of OSH, the National Institute of Labour Protection (NILP) has been concerned with the asbestos problem for a long time. In 1990, the NILP dispatched its staff to NIOSH, Australia for training on the qualitative and quantitative determination of asbestos. With the obtained knowledge and understanding about the different types of asbestos, the NILP's staff participated in drafting policies and standards related to asbestos.

In 2000, our NILP carried out the research project *"Prevention of the asbestos dust in production of asbestos materials."* The enterprise selected for study was the Dong Anh Roofing Tile Joint-stock Company. We conducted environment monitoring-analysis and put forward solutions for reducing pollution. The average results of the analyses for various sampling areas are shown in Table 1.

**Table 1. The results of environment monitoring in the Dong Anh Roofing Tile Joint-stock Company ( fiber/cm<sup>3</sup> )**

No	Position	1/3/2000	9/3/2000	10/5/2000
1	At side of the crushing-mill (grinder)	33.7	24.9	11.7
2	Mid of workshop of the crushing-mills (grinders)	11.3	10.5	9.1
3	At side of raw material mixer	1.8	1.1	0.7
4	At beginning of conveyer carrying asbestos.	3.5	5.3	-
5	Outside yard next to the grinding workshop	-	-	2.3

The reasons for existing pollution are: backward equipment; lack of knowledge of asbestos hazards; use of dry and open asbestos grinding technology that leads to spreading asbestos into atmosphere. After getting the results on the environment pollution and its causes, the asbestos-cement roofing tile enterprise has applied wet-asbestos grinding methods, resulting in a rather significant reduction in the amount of asbestos spreading into the atmosphere.

In 2002, the NILP took part in the implementation of a state project (NVCB-09): "*Study and assessment of the current status of environment in the asbestos-cement roofing tile enterprises and its influence on the workers' health and proposal of solutions.*"

In order to assess the level of environmental pollution, we selected 23 from the total of 35 asbestos-cement roofing tile enterprises in the whole country, with the following criteria:

- capacity of the enterprise above 1,000,000 m<sup>2</sup>;
- the enterprise had known pollution problems.

The enterprises are distributed in different areas (see Table 2).

**Table 2. Number of enterprises, date of conducting environment monitoring and analysis.**

Area	Total number of enterprises	Number of monitored enterprises	Date of monitoring
North	24	16	10-12/2002
Central	05	02	6/2003
The South	06	05	5/2003

In order to analyse and assess the environmental situation in each enterprise we took samples at the following positions:

- area of the asbestos grinding (on platform of the grinder and at the side the asbestos gets out);
- mixing area for the asbestos and cement;
- rolling area;
- asbestos warehouse.

Sampling and counting of the asbestos fibers were in accordance with the national standard TCVN 6504-1999 (ISO 8672-1993) using microscope E400, NIKON made in Japan. The results are shown in Table 3.

In comparison with the regulations 3733/2002/QD-BYT of the Ministry of Health (MOH) (Allowable concentration in 8 hours – 0.1 fiber/cm<sup>3</sup>; in 1 hour – 0.5 fiber/cm<sup>3</sup>) the obtained results showed that most of the studied enterprises are polluted by asbestos dust. The reasons are:

- no knowledge or understanding about the harmfulness of asbestos dust among the workers;
- no dust treatment and exhaust system;
- inadequate attention to OSH by the employers.

**Table 3. Asbestos concentration in the asbestos-cement roofing tile production enterprises (fiber/cm<sup>3</sup>)**

No	Enterprise	On the grinding platform		Under the grinding platform		Mixture area		Rolling area	
		Morn	Aftern	Morn	Aftern	Morn	Aftern	Morn	Aftern
1	Viet Tri Concrete & construction material Co.,	0.012	0.018	0.021	0.024	0.088	0.092	0.017	0.013
2	Bach Dang Joint-stock Co.,	1.084	0.397	3.184	0.046	0.080	0.242	0.097	0.843
3	Dong Anh Roofing Tile LICOGI 14	6.491	5.792	1.814	2.698	0.496	0.198	0.018	0.027
4	Thai Nguyen Metallurgy Co.,	0.078	0.155	0.097	0.124	0.092	0.222	0.027	0.133
5	Thai Nguyen Roofing Tile Manufacture	0.198	0.064	0.206	0.113	0.305	0.440	0.010	0.238
6	Dong Anh Const. Mater. Joint-stock Co.	0.487	3.134	0.303	0,064	0.386	1.093	0.137	0.214
7	Ha Giang Cement Co.,	0.061	0.076	0.135	0.288	0.149	0.120	0.043	0.045
8	Hung Long Co., Ltd	0.197	0.234	0.115	0.124	0.073	0.103	0.067	0.046
9	He Duong Cement Co.,	0.380	0.996	1.345	0.150	0.169	0.188	0.526	0.196
10	Lao Cai Cement Co.,	0.995	1.722	0.547	1.624	0.392	0.462	0.107	0.098
11	Nam Long Joint-stock Co.,	3.018	0.587	0.413	0.794	0.291	0.269	0.079	0.095
12	Chieng Sinh Cement Co.,	1.388	0.055	1.423	0.133	0.686	0.088	0.110	0.100
13	Xuan Mai Concrete Co.,	0.253	0.226	1.555	0.257	0.254	0.453	0.049	0.016
14	Nam Son Co., Ltd.	0.245	2.085	0.625	2.462	1.476	2.333	0.149	0.237
15	Ha Nam Construction Material Co., and Dong Anh Roofing Tile HAPRO	0.237	0.194	0.229	0.120	0.099	0.200	0.033	0.063
16	Khai Son Co., Ltd.	0.313	0.135	0.019	0.147	0.132	0.660	0.214	1.276
17	Ha Long Construction Material Co.,	2.572	0.595			0.748	0.724	0.443	0.124
18	Nam Viet Joint-stock Co.,	2.055	1.893	0.349	0.287	0.370	0.557	0.355	1.215

No	Enterprise	Grinding		Mixture		Rolling		Warehouse	
		Morn	Aftern	Morn	Aftern	Morn	Aftern	Morn	Afetrn
19	Van Long Construction Material Co.,Ltd	1.100	1.147	1.401	2.384	0.055	0.053	0.043	0.317
20	COSEVCO- Roofing Title	0.951	0.145	2.239	3.196	0.293	0.025	0.231	0.027
21	South Joint-stock Co.,	4.747	2.379	2.196	2.443	1.030	0.445		
22	Dong Nai Roofing Tile Joint-stock Co.,	0.171	1.384	0.730	0.317	0.364	0.799	0.085	0.060
23	Construction Material Co., No2	1.521	2.368	2.379	2.261	0.705	0.627	0.102	1.388

### 3. Status of the workers health and occupational diseases in the asbestos-cement roofing tile production enterprises

Health problems of the workers in the asbestos-cement roofing tile production enterprises have been paid proper attention since 1996, after the workshop held in Hanoi by the Ministry of Science, Technology and Environment. During implementation of the research task we could not conduct health examinations on all the workers exposed to asbestos in the 35 enterprises; we conducted health examinations only on 1,032 who were selected from 12 enterprises by length of employment, including retired people. The results are shown in Table 4.

**Table 4. Number of the workers examined by length of employment**

No	Years worked	Number of workers	(%)
1	<10	494	48
2	From 10 to 19	340	33
3	From 20 to 29	118	11
4	>30	80	8

These workers were selected from the different workshops.

**Table 5. Number of workers examined by working position**

No	Working position	Number of workers	(%)
1	Grinding	169	16
2	Mixture of materials	265	26
3	Making wave	95	09
4	Rolling	252	25
5	Other	250	24

Clinical examination was conducted by the method of Malasonosh, Slotraberg K. Tones AD (Health assessment) and based on the diagnosis criteria of IDC (Geneva 1994, V1, V2) and ILO (1980); making of X-ray film by ARCOMA – 200 Japan. The results are shown in the Table 6.

**Table 6. The results of X-rays**

No	Sign of X-ray film	Cases	(%)
1	Normal	1012	98
2	Not normal	20	2
*	Asbestosis at light level (1/0t and 1/0s)	4	0.4
*	Light silicosis ( 1/0P)	4	0.4
*	Having sign of doubt	2	0.2
*	Having sign of tuberculosis	5	0.5
*	Having sign of pneumoniocosis	5	0.5

The results of X-rays showed that, despite being newly built, in most of the roofing tile production enterprises in Vietnam there is a rather high level of pneumoconiosis (2%). We are sure that for a number of years this level will increase.

The results of the clinical examinations are shown in Table 7.

**Table 7. Symptoms of respiratory illnesses by length of employment**

Symptom	Total cases	Years worked			
		<10	10-19	20-29	>30
Difficulty in breathing	184	99	12	63	10
Feel uncomfortable in chest	238	137	9	88	4
Always difficult to breathe	2	-	-	2	-
Cough and phlegm in throat >1 month	17	9	-	5	3
Cough and phlegm in throat 5-7 days	240	119	12	91	18
Cough every day	147	85	9	47	6
Chronic inflammation of throat (angina)	268	137	6	105	20
Chronic inflammation of nose	21	7	2	7	5
Total number of workers	1032	494	340	118	80

The results of the above-mentioned health examinations proved that the environmental pollution in the asbestos-cement roofing tile production enterprises has a detrimental effect on the workers' health, in particular among the workers who suffer breathing difficulties and chest discomfort.

Moreover, the results also showed that in most of the newly built asbestos-cement roofing tile production enterprises having a rather high level (2%) of lung diseases, 0.4% (4/1032) of workers suffered from asbestosis. The number of people suffering from asbestosis will increase in the future.

#### 4. Urgent solutions

Due to the economic situation, Vietnam has not banned the use of asbestos for manufacturing roofing tiles. Since manufacture will continue for some years, we would, therefore, put forward the following urgent solutions to protect workers' health and the environment:

- asbestos-cement roofing tile production enterprises that have not registered a route of technological renewal and installation of systems of reducing the environmental pollution will not be allowed to continue to operate; the Vietnam Roofing Tile Association (VRTA) must take responsibility for persuading its members and non members to undertake technological renewal and installation of treatment apparatuses to reduce environmental pollution;
- the Ministry of Natural Resources and Environment (MONRE) should coordinate with the local Department of National Resources and Environment to regularly control and inspect asbestos-cement roofing tile enterprises to ensure their compliance with the OSH regulations;
- continue research into roofing tile production technology using other materials in order to fully substitute for asbestos;

- the asbestos-cement roofing tile enterprises should effectively implement the regulation of environment monitoring and analysis and periodical health examinations for the workers;
- organize regular training courses in OSH and environmental protection for all workers working in asbestos-cement roofing tile enterprises.

## 5. Conclusions

The working environment in asbestos-cement roofing tile enterprises in Vietnam has been polluted severely.

- Environmental pollution has impacted on workers' health.
- Working environment analysis, monitoring and periodical health examinations are necessary and must be implemented properly.
- The use of asbestos should be under strict control and we must move step by step toward elimination.
- With its experiences in research, the NILP will continue to exert its best efforts to contribute to the improvement of safety and health for workers in asbestos-cement roofing tile enterprises and toward eliminating all types of asbestos in the production of roofing tiles. During this process we have received great assistance and cooperation from other countries.

## References

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