

Countermeasures for Asbestos at Ironworks

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Abstract

Labor in the iron industry often involves high-temperature processing using hot metals and molten steels, as well as the frequent use of asbestos as a heat resistant or insulation material. Given that no studies have ever been performed on asbestos problems in iron foundries, I present a case study on an iron foundry company that started dealing with asbestos at an early stage.

At an iron foundry, use of asbestos is found in the following:

- *Blast furnaces/steel converters/rolling*
- *Hot blast stoves*
- *Molding boards for steel making/casting*
- *Boilers at power plants*
- *Brake lining for cranes*

The iron foundry company cited here started dealing with asbestos when dust emission caused by the high-pressure air cleaning of asbestos for steel making/casting molding boards emerged as a problem, and use of rock wool as an alternative material started in 1977. In the 1978 revision of the company-wide work environment control manual, the company set forth stricter environmental control criteria for asbestos, setting the asbestos concentration limit at 0.2 fibers/cm³.

Yokosuka Kyosai Hospital's 1982 report on asbestos lung cancer among shipbuilding workers prompted even stricter asbestos controls. In 1983, the management of the foundry compiled an asbestos handling manual, which prohibited use of asbestos for new facilities. In the same year, the company replaced asbestos with glass fiber in drop curtains of blast furnaces for duct collection. In 1988, the company conducted internal fact-finding surveys and started sampling research. In 1990, it was found in the analytical results that 161 (85.2%) out of 189 samples contained asbestos. In the same year, the company started to use non-asbestos alternatives for crane brake linings (an asbestos content of 40% to 50%). Also in the same year, the old naval shipyard reported malignant mesothelioma among workers of private shipbuilding companies. The foundry company then requested its relevant departments to remove all asbestos from existing facilities by May 1992. In the same year, all employees were examined for pleural thickening using chest X-rays. Of 2,689 employees, 16, 11 and 21 were diagnosed as IIIa, IIIb and IV, respectively (48 in total: 1.79%). Follow-up surveys are currently underway.

To date, none of those employees have been found to develop asbestos-related tumors. Removal of asbestos is nearly complete, although it is still found in some existing facilities or

part of brake linings for which no alternative materials are available. The company is now making efforts to remove all asbestos. Today, industry-wide efforts are needed to deal with asbestos to prevent asbestos related health problems in the iron industry.

Introduction

Figure 1 shows a typical process making steel strips at ironworks: main processes are as follows: 1) loading yard, 2) raw materials yard, 3) blast furnace, 4) molten cast iron, 5) mixing furnace, 6) desulfurizing process, 7) continuous steel casting, 8) making steel ingot, 9) isothermal furnace, 10) reheating furnace, 11) rough rolling mills, 12) hot strip mills, 13) hot rolled coil, 14) skin-pass rolling, 15) continuous treating of steel with acid, 16) pickled coil, 17) export yard

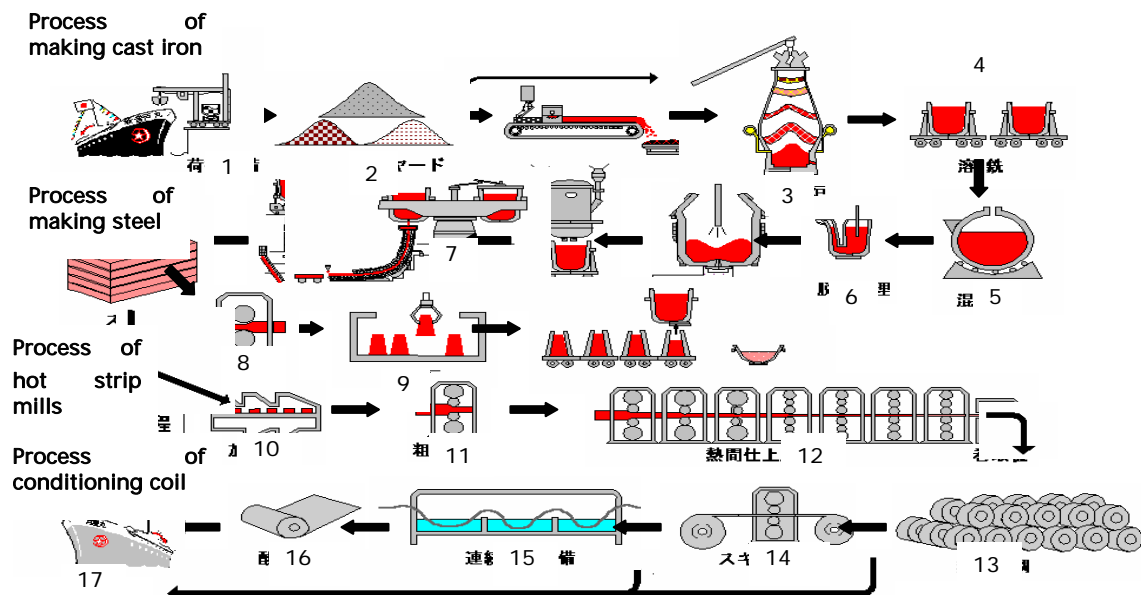


Fig. 1. Processes at ironworks. 1: loading yard, 2: material yard, 3: blast furnace, 4: molten cast iron, 5: mixing furnace, 6: desulfurizing process, 7: continuous steel casting, 8: making steel ingot, 9: isothermal furnace, 10: reheating furnace, 11: rough rolling mills, 12: hot strip mills, 13: hot rolled coil, 14: skin-pass rolling, 15: continuous treating of steel with acid, 16: pickled coil, 17: export yard

As an ironworks has many hot products and facilities such as blast furnace, mixing furnace, converters, continuous steel casting and hot strip mills, asbestos as heat-resistant material or insulator is used in many places. Because the problem of asbestos at ironworks has almost never been taken up until now, we will report the countermeasures to asbestos risks at ironworks. Figures 2-7 show the main hot processes.



Fig. 2. Blast furnace



Fig3. Molten cast iron



Fig. 4. Steel converter



Fig. 5. Continuous steel casting



Fig.6. Press process



Fig.7. Hot strip mills

1. Main process where asbestos is used

Asbestos is used mainly in 1) blast furnace, mixing furnace, steel converter, continuous steel casting and hot strip mills, 2) air-heating furnace, 3) steel ingot stand, 4) boiler in power plant, and 5) crane brake at ironworks. Figure 8-10 show the examples using asbestos at ironworks. Figure 8 shows asbestos used for smoke duct expansion in sintering. Figure 9 shows an asbestic brake-lining of a crane. The ironworks has many cranes for loading products, and workers were exposed to asbestos in the maintenance of brakes. Figure 10 indicates asbestic gaskets for joint sealing, and workers were exposed to it in the maintenance of ducts.



Fig. 8 Smoke-duct in sintering



Fig. 9. Asbestos brake-lining in crane



Fig. 10. Asbestic gaskets for joint sealing

2. Process of countermeasures for asbestos

The beginning of the countermeasures was conducted for asbestic dust in air-cleaning ingot stands in 1977. We changed the asbestos for rock-wool, and the countermeasures started after that.

In 1978, the work environment control rules in the company were changed, and the standard for the concentration of asbestos in air was set as 0.2 fiber/cc.

In 1982, taking cognizance of the report on asbestos lung cancer in Yokosuka Kyosai Hospital, the countermeasures were strengthened.

In 1983, the new control rule for asbestos was instituted, and the use of asbestos was prohibited in new facilities. In the same year, the asbestos was changed for glass-wool in the veil-style dust catcher in the blast furnace.

In 1988, we started to investigate asbestos in existing facilities. In 1990, we analyzed 189 samples and 161 (85.2%) samples contained asbestos. We began to change asbestic brake-linings, which contained 40 –50 % of asbestos, for non-asbestic ones in cranes. In the same year, Kure Kyosai Hospital reported malignant mesothelioma cases who worked in old navy or non-governmental shipyards. Therefore, we requested the concerned departments of the company to accomplish complete removal of asbestos from existing facilities by May 1992.



Fig. 11. Removal of asbestos in an air-heating furnace



Fig. 12. Signboard for removal of asbestos



Fig. 13. Negative air pressure facility for removal of asbestos

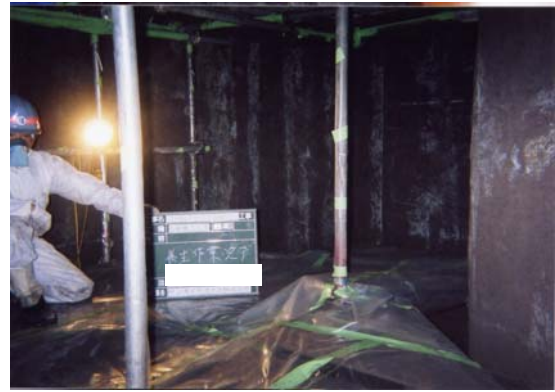


Fig. 14. Ready for removal of asbestos

In the same year, we began to investigate pleural thickening in indirect chest X-ray films for all workers at the ironworks. We found 48 positive (1.79%) cases in 2,683 workers as follows: the grade of the 48 workers includes IIIa 16, IIIb 11, and IV 21. We are continuing to follow up these cases, but so far have not found malignant tumors related to asbestos in this group.

Table 1 shows the distribution of the positive cases by the kind of occupation. Only workers in the departments using asbestos have positive findings. This table indicates the positive findings are related to occupational exposure of asbestos. The positive rate is 2.41% in the workers with possible asbestos exposure, and it is same as the rate of old people in the general population of Tokyo area (Ebihara, 1981).

Table 1. Distribution of the positive cases by the kind of occupation

Kind of occupation	No. of Subject	IIIa	IIIb	IV	Total
Workers in the departments using asbestos	1,987	16(0.80)	11(0.55)	21(1.05)	48(2.41)
Workers in the departments using no asbestos	46	0(-)	0(-)	0(-)	0(-)
Staff	650	0(-)	0(-)	0(-)	0(-)
Total	2,683	16(0.60)	11(0.41)	21(0.78)	48(1.79)

3. Conclusions

We have almost removed asbestos except asbestic products without alternatives and a few brake-linings of cranes where the crane maker couldn't guaranty the operational safety of non-asbestic brake-linings. We will completely remove asbestos in a few years. We propose the removal of asbestos to prevent asbestos-related health disorders in all iron manufacturing.

References

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