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Is the Chemical Exposure Control at Samsung Semiconductor Plants?

Problems of Chemical Exposure Control at the Samsung
Electronics' Semiconductor Plant in Giheung

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“The chemical exposure control is unsafe at Samsung Electronics semiconductor plants”

Corporate for All, People's Solidarity for Participatory Democracy (PSPD), Korean Women Workers Association, and Environmental Justice received some anonymous information on "The Advisory Report on the Evaluation of the Chemical Exposure control at the Samsung Electronics Giheung Plant (Hereafter refer to it as the Advisory Report)," issued by Seoul National University. Based on the problems addressed in the Advisory Report, along with the previous statements that the company made, the four civil organizations issued this report for a parliamentary audit, assessing the workplace environment at Samsung semiconductor plants.

The problems revealed by the Advisory Report at the Samsung Electronics Giheung Plant

1) Lack of data on substances and date of introduction of chemicals in use

- The Giheung plant (5th line) uses 99 types of chemical products and Samsung Electronics has never identified these substances. The dates of introduction to the plant for up to 60 percent of the products are unknown or unreported.
- Seoul National University studied the substances of 99 types of chemicals, 83 types of which turned out to be single chemical materials. The substances of 10 single chemical materials were not identified, as the company did not divulge the information due to its trade secrecy.
- Such an act runs counter to the Samsung's statement that, "all the chemical materials used in making chips are identified and known to employees, and the related information was submitted for an epidemiological survey." This discrepancy in reporting demonstrates the insufficient chemical control of the company.

2) The risks of the chemical exposure at Samsung Electronics semiconductor plants

- From February to July 2009, the gas detector was set off 46 times. The causes of the alarms (46 times in total) were
 - ✓ 25 cases (54%): The effect of remaining gases while conducting the Preventive Maintenance (PM) task even though the standard operating procedure (SOP) was followed
 - ✓ 11 cases (24%): A malfunction of the gas detector
 - ✓ 3 cases: SOP was not followed during the PM task
 - ✓ 33 cases: The gas leakage occurred when every manufacturing process was running normal
 - ✓ 4 cases: Causes unidentifiedIt was confirmed that even when the SOP was followed, the chemical exposure occurred while conducting the PM task and normal manufacturing processes.
- Some of the cases indicate that high concentrations of gas, which was 32% of IDLH (HBr, July 20th, 2009), leaked for an hour and 35 minutes (5,729 seconds). This shows that even after the gas detector went off and when it exceeded the permitted exposure limit, the leakage was not automatically shut off but went on more than an hour. The case directly challenges Samsung's argument that "when there is a gas leak, the safety device operates automatically."
- As for the chemical supply system for 99 chemicals in use, it turned out that '32 types are centrally provided through *pipe line*', and '65 types in *bottles* and 2 types in *drums* are replaced and replenished directly by employees'. These findings confirm that Samsung Electronics lied by insisting that "gases and organic solvents are replenished through the central supply system and emptied automatically after the process is finished."

3) The risks of the organic chemical exposure

- It was confirmed that not only gas but also organic solvents are used in making chips.

- According to the article “The Establishment of the Monitoring System on the Workplace Environment in the Chip-making, written by Gwansik Lee (Chief Coordinator of the Safety Department at the Giheung plant) and published in <Green Samsung> as of summer 2007, “There is no extra detector system set up for organic solvents...in order to protect the health of employees from their chronic exposure to odors of organic solvents in low concentration and to identify and repair the problem of a leakage, the monitoring system on the workplace environment was established in the plant on June 2007.” In addition, “60% of gases and chemicals used in making chips are hazardous. In the case of chemical odors occurring these can spread within 60 seconds due to the cooling water circulation system. Particularly, when odors contain toxins these can have serious health impacts on employees.” This indicates that internally Samsung Electronics already recognized the seriousness of the problem of odors: *that is, the organic solvents exposure*.

4) The insufficiency of the chemical exposure control

- The Advisory Report shows that the Giheung plant (5th line) controls the exposure levels, through the working environment measurement, for only 24 types out of the 83 single chemical materials (28.9%).
- Even though there are the exposure measurement methods in place and standards set for the five chemicals in use (BF₃, Catechol, NH₄OH, PGME, Sih₄), they were left out from the list of exposure control for the reason that they are not legally-bounding chemicals.
- In addition, it was pointed that Samsung reveals errors of their working environment measurement, regarding the number of samples to take, the duration of samples, the period(s) during the work day and in the year when the samples should be collected, and variation in workers.

Samsung Electronics should no longer avoid their responsibility for causing leukemia, and the Korean government and National Assembly should supplement policies and the control/management system to protect the health and lives of workers in the semiconductor industry

By reviewing the Advisory Report on the chemical use and exposure control of the Samsung Semiconductor plants, we found that ► the risk assessment and management of chemicals are insufficient ► the exposure control system covers only some of the chemicals that the company uses ► there exist the risks of the chemical exposure at the semiconductor plants ► there were cases of the highly toxic chemical exposure. These findings run counter to Samsung Electronics' current stance and reveal that the company has serious problems in their chemical exposure control. Therefore, Samsung Electronics should no longer avoid their responsibility for causing leukemia among their employees, and the Korean government and National Assembly should supplement policies and the control/management system to protect the health and lives of workers in the semiconductor industry.

In this regard, it is required that ► the cases of employees contracting leukemia at Samsung Electronics should be recognized as occupational diseases ► the ailing workers and the families of the deceased should be given appropriate compensations, and a better workplace environment should be provided ► the government should make it obligatory to disclose information on hazardous chemicals ► the National Assembly should supplement the Industrial Accident Compensation Insurance Act (i.e. easing the eligibility criteria for making claims relating to operational disease compensation) ► The Occupational Safety and Health Act should be amended to broaden the coverage of the chemical management and to strengthen exposure controls.

Is the chemical exposure control safe at Samsung Electronics semiconductors plants?

To date (the end of September, 2010) there have been 96 employees who contracted hematological cancer, brain tumor, and rare cancers at Samsung Semiconductor, Samsung LCD, and Samsung Electro-Mechanics plants, etc and 32 of them died. [source : SHARPs]

The victims and the family members of the deceased tried to seek industrial accident compensation benefits from the Korea Workers' Compensation & Welfare Service (KComWel), but KComWel disapproved their cases, based on the 2008 epidemiological survey by the Korea Occupational Safety and Health Agency (KOSHA), which concluded that the relationship between the illnesses and the workplace environment is low. Following the conclusion, Samsung Electronics has treated the leukemia cases among their employees as personal diseases.

However, last year Seoul National University carried out an epidemiological survey to measure the level of risks in the plants of three semiconductor companies and their report revealed that the carcinogenic 'benzene' was found in all of the worksites. As some of the report was leaked to the public, the credibility of the epidemiological survey by the Korea Occupational Safety and Health Agency was severely diminished as well as the level of safety of the chemical control at the Samsung semiconductor plants was brought into question.

In 2007 Yu-mi Hwang, a former Samsung semiconductor employee from the Giheung plant, died from acute myeloid leukemia at age 23, it ignited the allegation that Samsung Semiconductor's hazardous worksite environment is responsible for causing the disease. The following death of Ji-yeon Park at age 23 in March last year, from the On-yang plant, furthered the controversy. In addition, the issue also drew international attention as eight foreign investors including the All Pensions Group (APG) of the Netherlands sent Samsung Electronics a joint-inquiry letter requesting detailed information on the issue.

In response to the controversy, Samsung opened up the Giheung plant to the media and announced their plan to form a consortium consisting of international and domestic experts to "reinvestigate the workplace conditions of the semiconductor production line." However, no specific schedule for the investigation has been made public.

In the meantime, PSPD received some anonymous information on "the Advisory Report" last May. Seoul National University conducted an epidemiological survey for the period from June to October 2009 in five areas such as Occupational medicine, industrial ventilation, chemical exposure measurements, new technologies, and new production processes in six plants of the three semiconductor companies – Samsung Electronics (the Giheung and Onyang plants), Hynix (the Ee-Cheon and Cheongjoo plants) and Amkor Technology Korea (the Seoul and Gwangjoo plants). The purpose of the Advisory Report was to measure the level of risks in semiconductor plants and to devise preventative measures, and the parts we received are the evaluation on the chemical exposure at the Samsung Electronic Giheung plant.

This report aims to analyze the chemical use and problems, the problems of the working environment measurement, and the installation of gas detectors and related problems in the Giheung plant. Corporate for All, People's Solidarity for Participatory Democracy (PSPD), Korean Women Workers Association, and Environmental Justice received anonymous information on "The Advisory Report to Evaluate the Chemical Exposure at the Samsung Electronics Giheung Plant," issued by Seoul National University. Based on the findings of the Advisory Report, the four organizations issued this 'Civil Society Report for a Parliamentary Audit' which evaluates the safety of the workplace environment at Samsung semiconductors plants.

Problems revealed by the Advisory Report

1. Lack of data on substances and date of introduction of the chemicals in use

○ Problems

1) According to the Advisory Report, the Giheung plant (5th line) uses 99 types of chemicals in total. However, regarding the information on substances of the chemicals Samsung Electronics entirely relies on the material safety data sheets (MSDS), submitted by providers companies. Samsung Electronics never crosschecked the substances listed on the MSDS and it was up to 59 types of the chemicals (60%), of which date of introduction is lacking.

Table 1. The number of chemicals, forms, and supply system (5th line)

Number of Chemicals	Dates Checked	Substances Checked	Forms of Chemicals			Supply System		
			Solids	Liquids	Gases	Bottles	Pipe Lines	Drums
99 types	40 types (40%)	0 type	0 type	58 types	41 types	65 types	32 types	2 types

➤ When the number of chemicals is counted, if names are different they are put into different categories. In order to clarify substances and dates for which the products have been used, if substances are same but manufacturers are different they should be classified into different types.

2) The results of studies on substances of 99 chemical products show that 83 of them are single chemical materials. As for 10 of the 83 single chemical materials, the company did not disclose the information on these substances, arguing that it is their trade secrecy.

Table 2. The situation of the chemical exposure control (5th line)

Number of Single Chemical Materials	Substances Unidentified and the Percentage of the Content		Exposure Control		
	Less than 1%	More than 1%	Measured	Measured and Examined	Total
83 types	5 types	5 types	6 types	18 types	24 types

○ Summary

As addressed above, the Advisory Report reveals contradictory factors to the Samsung's statement, posted on their official Twitter site at 4 am on April 2nd, 2010, "the entire chemicals used in making chips were identified and known to employees, and its information was submitted for an epidemiological survey." The Report rather proves the allegation that Samsung Electronics has the insufficient chemical control system.

In addition, "The 2008 Epidemiological Survey on the Health of Employees Working in the Semiconductor Manufacturing Sector" by the Korea Occupational Safety and Health Research Institute scrutinized the list of chemicals that nine semiconductor assembly & processing plants use. The result revealed that "the total 431 chemicals and their product names became identified, and only 263 types of them had the Chemical Abstract Service numbers."

** Chemical Abstract Service (CAS) registry numbers are unique numerical identifiers for compounds, polymers, etc. The service is run by American Chemical Society and each CAS registry number is a link to a specific chemical substance. As of September 2007, it contains 31,745,275 organic chemical substances and 59,039,087 sequences. Approximately 50,000 new substances are added each week [Wikipedia]

This indicates that employees working at semiconductor plants including Samsung Electronics do not know the substances and the health impact of the chemicals that they use.

2. The risks of chemical exposure at Samsung semiconductor plants

o Problems

1) The Advisory Report addresses the problems of the current gas detector system. It says for six months (from February to July, 2009), the gas detector alarm went off 46 times at the Giheung semiconductor plant (5th line). The cases of gas leakage that lasted for less than 10 minutes consist of about 89%, and there is one case that leakage lasted for 5,729 seconds (1hr 35min).

The causes of the alarms (46 times in total) were

✓ 25 cases (54%): The effect of remaining gas while conducting the Preventive Maintenance (PM) task even through the standard operating procedure (SOP) was followed

✓ 11 cases (24%): Malfunction of the gas detector

✓ 3 cases: SOP was not followed during the PM task

✓ 3 cases: Gas leakage occurred when every manufacturing process was normal

✓ 4 cases: Causes unidentified

This implicates that even when the SOP is followed, the chemical exposure can occur while conducting the PM task. A more serious issue is that gas was leaked three times when every manufacturing process was normal.

Table 3. Gas detector alarm triggered for the last 6 months

Name of Products	Operational Type	Number of Alarm Triggered	Exposure Standards (ILV, ppm)	Cause of Alarm	ppm		Time Length of the Leakage(sec)	
					Average	Peak		
AsH ₃	IMP	1	TWA 0.005	PM (SOP followed)	0.005	0.007	486	
					0.5	0.6	31	
					0.5	0.5	27	
					0.5	0.8	96	
					0.5	0.5	32	
					0.5	0.6	74	
					5.8	6.2	91	
					0.5	0.8	43	
					6.2	10.2	81	
					0.5	0.5	24	
BCl ₃	ETCH	13	-	-	0.5	0.6	35	
					0.5	0.6	36	
					0.5	0.5	36	
					0.5	0.6	35	
					0.5	0.6	36	
					0.5	0.5	36	
					0.5	0.7	39	
					1.14	1.14	395	
					1.28	1.28	2448	
					0.06	0.06	11	
Cl ₂	ETCH	3	TWA STEL 1	0.5	Cause unidentified	0.06	0.06	6
						0.06	0.06	6
F ₂	PHOTO	1	TWA STEL 2	1	Cause unidentified	0.06	0.06	6
H ₂	DIFF	5	-	-	PM (SOP followed) Detector	918	918	21
						719	719	22

					Malfunctioned			
					Malfunctioned	233	233	24
					Malfunctioned	153	153	25
					Malfunctioned	1,000	1,000	19
					PM (SOP followed)	0.3	0.3	35
					Followed	0.3	0.5	163
					Followed	0.3	1.7	681
					Followed	0.3	0.3	83
					Followed	0.3	0.3	62
					Not followed	9.7	9.7	199
					Leakage	6.4	9.5	5729
					PM (SOP followed)	14.6	14.6	21
					Cause unidentified	2.59	2.59	22
					Cause unidentified	10.4	10.4	683
					Detector Malfunctioned	12.9	12.9	22
					Malfunctioned	3.29	3.29	22
					Malfunctioned	2.79	2.79	19
					Malfunctioned	2.55	2.55	26
					Malfunctioned	15	15	19
					Malfunctioned	0.065	0.065	799
					Malfunctioned	0.8	0.8	441
					PM (SOP followed)	0.5	0.9	80
					Followed	0.5	0.8	347
					Followed	3.3	3.3	416
					Followed	3.1	3.1	415
					Followed	2.9	2.9	411
					Followed	2.7	2.7	412

2) The Advisory Report shows the chemical supply system and specifies that 32 types are centrally provided through *pipe line*, and 65 types in *bottles* and 2 types in *drums* are replaced and replenished directly by employees. (see Table 1). In the meantime, it points out that the internal supply system such as bottles or drums has the exposure risk when they are opened, closed, and divided into smaller amounts and also when they are not properly managed inside plants. In addition, the central supply system including pipe lines has the highest risk of leaks due to factors such as a ruptured pipe.

o Summary

The Advisory Report confirms that there is a high risk of chemical exposure and in fact, related accidents have occurred frequently.

That is, it runs counter to the Samsung Electronics' previous statement. On April 15th 2010, the Hangyere newspaper introduced a quote from a former Samsung semiconductor engineer, "while I was working at Samsung, accidents of gas and solvent exposure took place frequently and sometimes 2-3 times a month." In response to such testimony, Samsung explained "gases and organic solvents are replenished through the central supply system and emptied automatically after processing. In case of leaked gases, safety devices operate automatically."

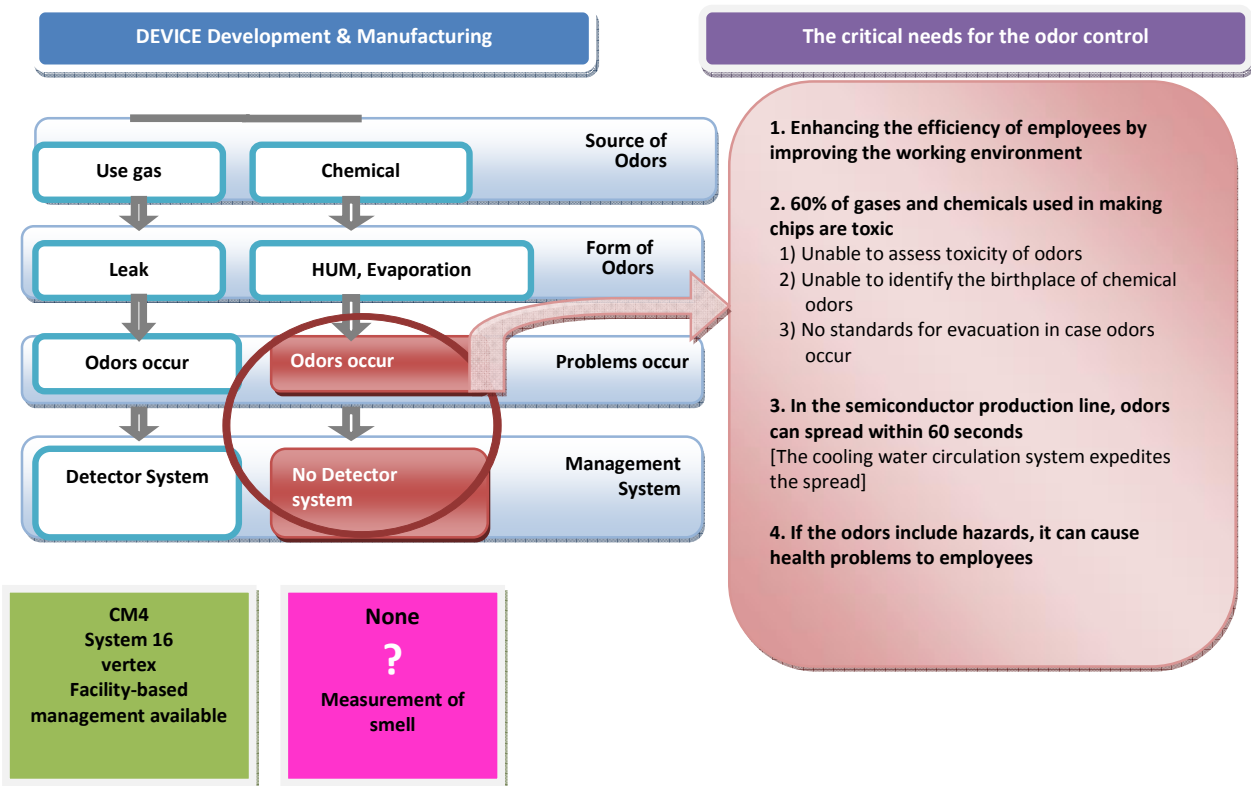
Unlike their explanation, however, there are cases showing that although the alarm went off and the gas leak rate went beyond the exposure limits, the leaks were not automatically shut off but lasted more than an hour. For example, according to the Advisory Report, the highly concentrated gas, which was 32% of Immediately Dangerous to Life or Health (IDLH) concentration (HBr, July 20th, 2009) leaked for 5,729 seconds (1hr 35min)."

3. The risks of non- gaseous chemical exposure

o Problems

1) It was confirmed that organic solvents other than gases are used in making chips. According to the article “The Establishment of the Monitoring System on the Workplace Environment in the Chip-making, written by Gwansik Lee (Chief Coordinator of the Safety Department at the Giheung plant) and published in <Green Samsung> in summer 2007, “Although we have the gas detector system to monitor and manage gas leaks in the manufacturing sector, but there is no extra detector set up for organic solvents...in order to protect the health of employees from their chronic exposure to odors of organic solvents in low concentration and to identify and repair the problem of a leak the monitoring system in the workplace environment, after a six-month demo test, was established in the plant on June 2007 .””

According to the article, “60% of gases and chemical materials used in making chips are hazardous. In addition, if chemical odors occur in the semiconductor production line they can spread within 60 seconds due to the cooling water circulation system. Particularly when odors contain toxics it can impose serious health impact on employees. This indicates that internally Samsung Electronics recognized the serious problem of odor control: that is, organic solvents exposure.”



<Source: <http://www.greensamsung.com/webzine/200708/15.html>>

○ Summary

The <Sisa-In> magazine received some sources of the report on ‘the Measurement of the Atmospheric Concentration Levels of Organic Solvents’ and, in its 146 issue on July 6th, 2010, covered an interview that “carcinogens as well as chemicals which they had not seen or used were found through the measurement.” The article also introduced the case of Hynix Semiconductor that, “some toxics can be unintentionally produced by complex chemical reactions in making chips.” Based on that, we speculate that in addition to the chemicals that semiconductor companies use, some unknown hazards can be made as byproducts in the manufacturing process. According to the interview in the article, Hynix “consults such situations and shares the results of the measurement on working environment with the union since employees working at plants get to know about those byproducts before anyone else.”

However, the article mentioned that even though Samsung Electronics continuously manages and accumulates the information that they monitor, they refuse to open it due to their ‘trade secrecy’ in response to the request for information disclosure, which contradicts to Hynix.

4. Insufficiency of the existing chemical control system

○ Problems

1) The Advisory Report shows that in the Samsung semiconductor Giheung plant (5th line) the working environment measurement on the exposure levels covers only 24 out of the 83 single chemical materials (28.9%) (see Table 4).

That is, the Giheung plant carries out the exposure control only for 24 out of 83 single chemical materials (including 10 unidentified chemicals), which are subject to the Occupational Safety and Health Act. However, the Advisory Report emphasizes that although BF₃, Catechol, NH₄OH, PGME, and SiH₄ are not subject to the law, the exposure control is critical since there are already exposure measurement methods and exposure standards set for them and health protection should be provided for employees.

** This implies that these chemicals are basically toxic or environmentally-hazardous chemicals if the exposure standards exist.

✓ BF₃ may cause eye and skin irritations and difficulty in breathing. The exposure to the high level of BF₃ may burn mucous membranes and the exposure to over 50ppm will lead to critical consequences such as heart failure, lung edema, pneumonia.

✓ Catechol may cause eye and skin irritations, difficulty in breathing, the risk of burning, emesis, diarrhea, stomachache, headache, fainting, and even and lead to death. The chronic and long-term exposure can damage kidney and the central nervous system.

Table 4. The list of chemical materials, which are not subject to law but can be assessed

Name of Chemicals	Substances/ Storage Type	Operational Process	Monthly Use	Exposure Standard
BF ₃	Single Chemical Materials/ Bottle	IMP	0.75kg	C1 ppm(ACGIH)
Catechol	Compounds/ Pipe Line	CLEAN	3,540L	5 ppm(ACGIH)
NH ₄ OH	Compounds/ Pipe Line	CLEAN	3,200L	ILDH,100 ppm(NIOSH)

PGME*	Compounds/ Bottle	PHOTO	3.7L	100 ppm(ACGIH)
SiH ₄	Single Chemical Materials/ Bottle	PHOTO	340kg	5 ppm(ACGIH)

* 1-Methoxy-2-propanol or Propylene glycol monomethyl ether

2) The advisory team of Seoul National University analyzed the results of surveys on the working environment conducted in 2007 by interviewing operators and engineers at the Giheung plant. The survey included studies on 59 chemicals and 2, 427 cases of the working environment measurement, and was conducted from 8am to 5pm no matter the schedule of shifts. The samples were collected for over 6 hours per day and evaluated based on TWA concentration levels for 8 hours.

Based on the results of the surveys, the Advisory Report addresses the problems of the working environment measurement, conducted by Samsung Semiconductor, regarding the number of samples to take, the duration of samples, the period(s) during the work day and in the year when the samples should be collected, and variation in workers.

- The number of samples to take: According to the current Occupational Safety and Health Act, only 189 types of chemicals are subject to the exposure measurement. This reveals the fundamental limitations on conducting a comprehensive exposure measurement, which is required to cover various chemicals that are used in the semiconductor industry.
- The duration of samples: The current methods neglect critical factors such as toxicity, exposure standards, and exposure patterns of each chemical, and collect random samples for over 6 hours and evaluate them all based on TWA concentration levels for 8 hours. This method does not include task-based (i.e. a cleaning work in the maintenance process) short-term evaluations, and reveals limitations on the assessment of the actual chemical exposure levels.
- The period(s) during the work day when the samples should be collected: The current Fab line operates for 24 hours and employees work in 2-3 shifts. However, to date all the measurements were conducted between 9am to 6pm without considering the shifts. This is based on the assumption that the characteristics of all the shifts are identical, which may fail to accurately reflect reality.
- The period(s) during the year when the samples should be collected: The current working environment measurement is conducted by an agent on consignment. The assigned agency carries out a measurement on each operational process in each plant for a particular task on a particular time of the first/second half of the year. However, this can be appropriate only when the pattern of the chemical exposure is identical all year around.
- Variation in workers: There are different groups of working duties, which shows the similar characteristics of the chemical exposure, but there is no systematic effort to classify them into the similar exposure group or to apply them into the exposure measurement.

○ Summary

As addressed above, the working environment measurement only covers a very limited number of chemicals that the company uses.

In addition, as found in the article of <Green Samsung> even when the average concentration level -measured for 8 hours- does not go beyond the legal exposure standards there still can be instant exposure risks. The article included the results of a 6-month-long demo test and the onsite analysis, revealing that the main cause of chemical odors is organic solvents and the smells can be produced by various factors such as facility trouble or

maintenance process. There were cases that the instant concentration level went over the company's exposure level but it was the lowest level, as compared to the 8-hour-weighted average.

The Advisory Report pointed out that "while the standard operating procedure (SOP) was followed, the chemical exposure occurred during the preventive maintenance (PM) task. The company was given a warning about the possibility of the chemical exposure even in the normal manufacturing process years ago, but they had not improved the situation." Also, according to the results of 'the Working Environment Measurement on the Giheung plant (5th line)' conducted by the Korean Institute for Environment Hygiene and Safety (KIEHS), in the first half of year 2006, "employees assigned in the PM task are more likely to be exposed to highly concentrated toxic chemicals for a short instance, and regarding simple tasks they directly deal with them in the service area so there is also a possibility of the second-hand exposure risks." If the company made efforts to improve the working patterns or environment based on the results of the working environment measurement in 2006, the same problems would not have been addressed again by Seoul National University in 2009.

Samsung Electronics should not avoid their responsibility for causing employees leukemia as their problems of the chemical exposure control became revealed!
The Korean government and National Assembly should supplement policies and the control/management system to protect the health and lives of workers in the semiconductor industry!

By reviewing the Advisory Report on the chemical use and exposure control of the Samsung Semiconductor plants, we found that ► Samsung Electronics' chemical control is too limited to fully protect the health of their employees ► the existing chemical management system is insufficient to detect the exposure during actual operational processes ► and the company has not properly responded to the dangers found in past years.

Although Samsung Electronics has not violated any standards imposed by the Occupational Safety and Health Act, this does not guarantee that the company provides a safe workplace environment to their employees. Moreover, as this Advisory Report confirms the serious flaws of Samsung Electronics' chemical control, the company should provide appropriate explanations for these flaws and should no longer avoid their responsibilities for causing leukemia among employees in their semiconductor plants.

The problems of the chemical control and the safety issues of the workplace environment are not limited to Samsung Electronics. As illustrated in the Advisory Report, the fact that various problems are not regulated by the existing Occupational Safety and Health Act systems from two factors – one is the characteristic of the semiconductor industry that adopts new technologies immediately and the other is the failure of the current law to keep up with the pace of such changes. Korea occupies 10.8% of the world market share in the semiconductor industry, which is fourth place in the world raking after the United States, Japan, and European Union. In addition, there are up to 200,000 employees working in the area in Korea. Therefore, the Korean government should reform the Occupational Safety and Health Act, and strengthen the occupational safety management and control in order to protect the health and lives of workers.

Korean civil society thereby make the following requests.

○ **First, the Korea Workers' Compensation & Welfare Service (KComWel) should recognize cases of leukemia as an occupational diseases**

KComWel has not recognized the cases of Samsung employees' leukemia as an occupational diseases, based on the 2008 epidemiological survey by the Korea Occupational Safety and Health Agency (KOSHA), which concluded that the relationship between the illnesses and the workplace environment was low. However, there are a number of testimonies revealing the problems of the safety management in the plants and the Advisory Report also points out various flaws of the chemical control of Samsung, Therefore KComWel should recognize the diseases as an occupational diseases.

○ **Second, Samsung Electronics should provide appropriate compensations for the ailing workers and the families of the deceased, and improve a better workplace environment.**

Because the Advisory Report reconfirmed the problems of Samsung Electronics's chemical control, the company should provide appropriate compensations for the ailing workers and the families of the deceased, and improve a workplace environment. In addition, the fact that foreign investors issued a joint-inquiry letter to Samsung Electronics is closely related to Samsung Electronics' international status (second place in world semiconductor sales, 2008). Therefore, the company should live up to its expectation and take action to prevent industrial accidents and to improve a working environment.

○ **Third, all information should be disclosed to fulfill the people's right to know**

1) The Korean government and National Assembly should impose regulatory requirements to disclose all the information of hazardous chemicals

Currently, hundreds of chemicals are used in the semiconductor industry, the information of what kinds of, how much and how those chemicals are used has not been disclosed due to trade secrecy. However, given that such information directly affects the health and safety of workers, such excuses should not be allowed.

Silicon Valley, located in Santa Clara County, California, became a leader in chemical policy even inside the United States by enacting 'the Toxic Substances Control Act (TSCA)' in order to guarantee the community's right to know during the period of 1970s and 80s. It was introduced in response to health and environment problems caused by the electronics industry. For example, TSCA under section 4 provides authority to require to open and to archive a list of toxic substances, which are stored or used in each worksite.

The California "Hazard Communication Regulation: Training and Prevention" stipulates employers' responsibilities for making sure that their employees are trained, prior to starting work, on the identities and hazards of chemical substances they are or may be exposed to in their jobs. In addition, the California 'Proposition 65' demands a list of chemicals that can cause cancer and birth defects publicly available annually, and also state's 'Air Toxics Program' includes manufacturers' obligation to report the emissions of toxic chemicals used in manufacturing processes to the public and the government.

The US federal law grants workers a right to know the identities and hazards of all chemicals which they use, and requires certain industry groups to report it to the "Toxic Chemical Release Inventory" publicly available for local residents.

Internationally "Registration, Evaluation, Authorization and Restriction of Chemical substances (REACH)", which entered into force since June 1st 2007, requires the disclosure of the information on chemical substances.

However, opposite of such international trends, Samsung Electronics adheres to their stance that, "due to trade secrecy, the company already submitted to the government and cannot disclose this information", which was provided for the evaluation on the former workers' compensation cases. In addition, the Korean government agencies such as the Ministry of Labor, the Occupational Safety and Health Agency, the Workers' Compensation and Welfare Service, etc also did not comply with the victims' request for the information disclosure.

2) The Korea Occupational Safety and Health Agency should open the full texts of "The 2008 Epidemiological Survey on the Health of Employees Working in the Semiconductor Manufacturing Sector", "The 2009 Study on the Characteristics of the Working Environment and the Toxic Exposure for Semiconductor Plants Workers I", and "The Epidemiological Survey for the Evaluation on the

Relationship between the Workplace Environment and the Occupational Disease Claims by Former Samsung Electronics Employees.”

The Korea Occupational Safety and Health Research Institute, a sub-organization of the Occupational Safety and Health Agency, has updated and opened titles, names of researchers, issuance year, summary, index and the full texts of the reports that they publish directly or on consignment through their website (<http://oshri.kosha.or.kr>) every year. However, they have not disclosed any relevant reports since the issue of Occupational disease including Samsung Semiconductor employees' leukemia became known.

3) Samsung Electronics should disclose the full test of the Advisory Report

Seoul National University conducted an epidemiological survey for the period from June to October 2009 in five areas such as Occupational medicine, industrial ventilation, chemical exposure measurements, new technologies, and new production processes in the six plants of the three semiconductor companies – Samsung Electronics (the Giheung and Onyang plants), Hynix (the Ee-Cheon and Cheongjoo plants) and Amkor Technology Korea (the Seoul and Gwangjoo plants). The purpose of this Advisory Report was to measure the level of risks in semiconductor plants and to devise preventative measures, and the parts we received are the evaluation on the chemical exposure at the Samsung Electronic Giheung plant. Samsung Electronics should disclose the final report on the evaluation of the risks in Semiconductor plants, including the whole five areas in the Giheung and Onyang plants.

4) Samsung Electronics should open their answers to the inquiry issued by their foreign investors

On May 31, 2010, in response to Samsung Electronics' announcement that it would form a third-party-consortium to carry out an epidemiological survey, eight foreign investors including the All Pensions Group (APG) of the Netherlands sent an inquiry letter to Samsung Electronics and raised six questions about Δwhen the company would implement their plan Δwhat the company would do with the results of the survey Δto what extent they would open the results to the media and investors Δwhether they provided medial support to their ailing former employees Δwhether they provide appropriate employee trainings, and Δ the efficiency of the whole workplace safety control. Samsung Electronics should make public their answers to the inquiry issued by their foreign investors.

○ Sixth, the Korean government and National Assembly should amend the Occupational Safety and Health Act and the Industrial Accident Compensation Insurance Act

1) The Korea Workers' Compensation and Welfare Service (KComWel) should ease the eligibility criteria for claiming operational disease compensation

To date, KComWel has not approved Occupational diseases unless a claimant proves a “naturally and scientifically” clear causal relationship. Consequently, no former Samsung Electronics employees, who suffered from operational disease, has received compensations from the agency. It is almost impossible to find evidence which can prove a ‘clear causal relationship’ between rare cancers and the workplace; particularly, when the victims already left the plant years prior to contracting the disease. Therefore, only 4-5 cases of cancers were approved as occupational diseases per year throughout the nation.

Employees who contracted Occupational diseases such as cancer are basically excluded from the benefits of industrial accident compensation. The current practices of KComWel, which applies very strict eligibility criteria, do not match with the purpose of the Industrial Accident Compensation Insurance Act, and the Korean Supreme Court has pointed out its unfair dealing through several precedents.

2) The Occupational Safety and Health Act should be amended to control carcinogens

The carcinogenic inventories of five agencies such as IARC, ACGIH, EU, NTP, EPA include 464 carcinogenic substances including 34 carcinogens in Group 1. However, the current Occupational Safety and Health Act and the Toxic Chemicals Control Act regulate only 90 carcinogens in total. The level of the carcinogenic regulations in Korea is far below the international standards and they are not consistent even within the same legal system as Cadmium is defined as carcinogenic in <the list of subject chemicals> but left out in <the exposure standards>.

Table 5. [Carcinogenic Inventory 1.0] of ‘The Carcinogen Monitoring Network’

Category	Standards	Number of Chemicals
Category 1	Definitely carcinogenic to humans : The assessment is based primarily on human evidence	34
Category 2	Probably carcinogenic to humans : Human evidence is insufficient but animal evidence is apparent : Various grounds suggest the probability	179
Category 3	Not classifiable as to its carcinogenicity to humans : The assessment is based primarily on animal evidence	251
Total		464

Table 6. Classification of Carcinogens in Korea

Relevant Law	Category	Classification	Number of Chemicals
Occupational Safety and Health Act	Hazardous Chemicals - carcinogenic	Substance which causes or increases the possibility of cancers	
	Exposure Standard A1	Confirmed carcinogen	22
	Exposure Standard A2	Presumed carcinogen	41
	Chemicals to be controlled - carcinogenic	Confirmed or suspected carcinogen	9
Toxic Chemicals Control Act	Toxics	Substance classified <ul style="list-style-type: none"> ▪ as Group 1, which is definitely carcinogenic to humans ▪ as Group 2A, which is probably carcinogenic to humans by international agencies such as IARC Carcinogenic substance confirmed by more than two carcinogenic experiments	49
	Chemicals to be observed	Substance classified <ul style="list-style-type: none"> ▪ as Group 2B, which is probably carcinogenic by international agencies such as IARC Carcinogenic substance confirmed by experiments on more than one kind of animal	

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