Wastewater Management Practices of Micro and Small Screen-Printing Companies
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Abstract:
Wastewater management during screen reclamation is one of the major environmental issues if not the biggest challenged faced by screen-printing companies in the Philippines today. In order to abide with local and national government rules and regulations in proper wastewater disposal, some printing companies invest on an on-site wastewater treatment and disposal and others hire a service provider to handle wastes. This study focused on identifying the existing practices in wastewater management system observed by the micro and small screen-printing companies in the Philippines. Such practices are the cleaning of screens used during the printing process (screen reclamation), wastewater prevention, minimization, monitoring and even seminars and training being provided to the employees. The descriptive research design was used in this study with one hundred forty-six (146) employees that belonged to six (6) different organizations from micro and small screen-printing companies who served as respondents in the study. With the existence of the screen reclamation practices and other related norms in prevention, minimization, monitoring and disposal of wastewater, the micro and small screen-printing industry has the capability to implement such structured wastewater management system that would enable the said industry to comply with the local and national rules and regulations in relation to proper wastewater management.

Keyword: micro and small screen printing companies, screen reclamation, wastewater management.

I. INTRODUCTION
In the Philippines, the screen-printing companies often generate ink-contaminated wastewater. This is due to the fact that several micro and small screen printing companies do not use computerized printing machines that can automatically control wasted ink. Instead, these companies apply manual printing, using primarily screen and squeegee to transfer the ink to the substrate then followed by either natural air-drying or blower-drying. From the said process, majority of the wastewater comes from reclaiming the screens or screen reclamation, the process of cleaning the screens that are used in the previous operation to be able to reuse in the next printing operation. The wastewater generated from the said process typically goes directly down the drain without any proper treatment and disposal made. Screen printing companies send wastewater posing troubles in plumbing system, health and environment as wastewater goes directly to a wastewater treatment facility, a body of water or a printer’s septic tank. These practices cause problems not just within the company but most especially in the environment due to non-compliance with environmental regulations set by the government (Keeman and Randall, 1995). This study is focused on identifying the existing practices of the micro and small screen-printing companies in the prevention, minimization and monitoring of wastewater. Employees and top management of the screen-printing companies can establish proper wastewater management system in managing the wastewater generated from the operation and reclamation of used screens.

II. METHODOLOGY
The descriptive research design was used in this study. Micro and small screen-printing companies were the main focus of the study. The one hundred forty-six (146) respondents came from the members of the six (6) different organizations such as the Philippine Screen Printing Association (PSPA), Association of Screen Printers in the Philippines (ASPP), Screen Printing Advocates Worldwide (SPAW), T-shirt Printing Expert Philippines (TPEP), Print Pinas Group (PPG), and Silk screen Printing Group (SPG) as well as respondents from Metro Manila who are considered under the category of micro and small-sized enterprises and that are involved in executing manual screen-printing in textiles or fabrics. The respondents were given the validated survey questionnaires which were mailed and/or linked electronically to the members of the six (6) mentioned organizations. Hard copies were given personally to the rest of the respondents and interviews were also conducted to clarify such matters. Data and results were presented through descriptive statistics. The sampling technique that was used in the study was purposive sampling. The researcher consciously selected the members of the mentioned screen printing organizations who participated in the survey proper based on variety of criteria.

III. RESULTS AND DISCUSSIONS
Screen Reclamation Practices
The screen printing companies have the corresponding screen reclamation practices:
- The number of screens cleaned in a week is less than 20 screens according to majority, 60% and more than 80 screens for the minority, 1.5%.
- Most of the respondents, 35.6%, take 8 to 10 minutes to clean one screen while lesser respondents, 15.1%, less than 5.
- The amount being spent is less than ₱500 per week for the cleaning solutions.
- Seventy-five percent, do not conduct wastewater treatment while the minority, 0.7%, hires contractors.
- The 32.9% are disposing wastewater on the drainage or canal.
• Also, 58.9% do not have written policies/guidelines in screen reclamation.

**Practices in Wastewater Management**

There are other practices beyond screen reclamation process that affect the system of wastewater management within the printing companies. These practices are in relation to prevention, minimization and monitoring of the generated wastewater.

*Figure.1. Practices in the Prevention of Generation of Wastewater*

Employees were asked to identify the common practices observed in the companies/businesses in relation to the prevention of wastewater generation from screen reclamation. As shown in Figure 1,

- Most of the said respondents, 103 or 70.5% observed the practice of keeping work areas clean and well organized.
- Eighty-eight or 60.3% noted the storing of materials in a way that keeps them from being damaged.
- Fifty-six or 38.4% perceived the norm of inspecting containers periodically for leaks and other damages.
- Forty or 26.7% for reusing of inks and cleaning solutions.
- Fourteen or 9.6% for requiring Material Safety Data Sheet (MSDS) from the suppliers.
- Eight or 5.5% stated that none of the mentioned practices were observed.

This entails that majority of screen printing companies are making effort to avoid the generation of wastewater.

*Figure.2. Practices in the Minimization of Wastewater*

*Figure.3. Practices In The Monitoring Of Wastewater*

Figure 2 recognizes the actions that are being taken by the screen printing companies/business in order to lessen the accumulation of wastewater production during printing operations. Bigger number of employees responded the removal of inks from squeegee, spatula, stirring sticks, scoops, buckets, etc. as a way of minimizing the use of greater volume of water, 00 or 67.8%. Ninety or 61.6% for the practice of scraping as much of the ink from the screen before cleaning, 74 or 50.7% for using non-toxic and environment-friendly inks, 39 or 26.7% for reusing of inks and cleaning solutions, 31 or 21.2% for using of drain-safe cleaning solutions, while 2 or 1.4% of the respondents did not observe any of the mentioned practices.

*Figure.4. Frequency of Trainings and Seminars on Proper Wastewater Management*

*Figure 3 shows the practices in monitoring of wastewater. Majority of the employees, 53 or 36.3% observed recording the amount of ink and cleaning solutions used. With almost the same rating with the majority, 52 or 35.6% of the respondents did not notice such norms in relation to monitoring of wastewater. The rest, 43 or 29.5%, 42 or 28.8%, 26 or 17.8% and 10 or 6.8% observed the tradition of recording the number of screens washed, recording the volume of water used based on the water bill statement, keeping track of the characteristics of wastewater generated, and sending sample of wastewater for laboratory analysis, respectively. This means that monitoring of generated wastewater is not usually done by several screen printing companies/businesses.*
Figure 4 reveals the frequency of trainings and seminars being provided by the micro and small screen printing companies/businesses regarding proper wastewater management. As perceived by the majority of the employees, 57 or 39% responded that there are no trainings and seminars being provided to them by the companies, 36 or 24.7% of the respondents stated for sometimes being given with, 29 or 19.9% for rarely, 14 or 9.6% for often and 10 or 6.8% for always. This means that most of the screen printing companies/businesses are not providing trainings and seminars that could result to limited awareness and disinterest of the employees to practice proper wastewater management during printing operation. From the survey findings regarding the current practices on wastewater management during screen reclamation, this shows that the printing companies have existing technological resources that can be utilized in the implementation of the wastewater management system. Although most of the facilities, materials, tools, and equipment used during screen reclamation are still basic and traditional, these resources can be enhanced and modified to established a good and sound wastewater management system It is also evident from the findings of the survey that few of the screen printing companies have already invested and are currently using some of the screen printing materials and equipments in washing and cleaning of screens except during the treatment stage of wastewater. Such materials and equipment are high pressure water spray, all-in-one cleaning solutions and washout booth. This reveals that portions of the screen printing industries are already aware of the existence of these screen reclamation technologies and are said to have the adequate technical resources and capabilities to utilize these technologies and be able to realize/materialize the benefits that are brought about by the technology adoption. Thus, screen printing companies can be transformed to acquire proper wastewater management system during screen reclamation process.

IV. CONCLUSIONS

Since several micro and small screen-printing companies had already invested and currently utilizing screen reclamation equipment and technologies accompanied with the existence of the screen reclamation practices and other related norms in prevention, minimization, monitoring and disposal of wastewater, the screen printing industry, therefore, has the potential to shift and adopt such structured wastewater management system that would enable the said industry to comply with the local and national rules and regulations in relation to proper wastewater management.

V. REFERENCES:


