How Industries Integrate COVID-19 Countermeasures Support with Environmental Concern and Community Development in Bandung, West Java: The Pindad Bandung Case Study

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Abstract
The unprecedented COVID-19 pandemic, which has also impacted all corners of Indonesia, meanwhile, has impacted Indonesian people's socioeconomic welfare adversely, as well as the financial performances of industries recently. This has motivated several industries which are economically strong enough to still resume their operations to contribute something valuable to the national effort in responding to this disaster, particularly in helping these companies' main business stakeholders as well as the local people living in the vicinity of these companies' operational areas whose livelihoods have been adversely impacted by it. The paper will address Pindad's efforts in overcoming the adverse impacts of the COVID-19 pandemic in its operational areas, while modifying its production processes to comply with the advised health and hygiene protocols, two actions which implementation the company attempts to align with its environmental management and community empowerment principles. Pindad's best practice in environmental impacts reduction has been able to reduce its energy use by 0.8 GJ, bringing down carbon emission by 0.12 tons of PM per annum, reducing toxic and hazardous waste by 12 tons, managing the non-toxic and hazardous waste by 40 tons, conserving biodiversity amounting to 5 squirrels in the area, as well as involving 15 locals in its community empowerment and agricultural land conversion program. Further, the paper will also address how the company is conducting all the activities mentioned above amid all the circumstances surrounding the pandemic-inflicted Indonesia in general, as well as within the specific context of the Bandung city itself.

Keywords: Pindad, Environmental Management, Community Empowerment, COVID-19 Pandemic, Bandung City, Indonesia

Introduction

PT Pindad (Persero) is an Indonesian manufacturing industry corporation located in Bandung, West Java. In its production processes, Pindad also supports the manufacturing of commercial heavy equipment, industrial tools, as well as services related to these products nationwide to boost the domestic production of such machineries. No different from other manufacturing industry players, Pindad has also attempted to step up on its sustainable clean production and environmental management practices. You can see Pindad's operational location in Picture 1.

Picture 1: Pindad's operational location in Bandung, West Java

Needless to say, the COVID-19 pandemic, which has hobbled every part of the globe, has also affected various industrial sectors, be it in terms of supply chain and their products, as well as the health condition of their workers. Keeping this in mind, Pindad has continuously applied health and hygiene emergency and safety protocols to all its personnel conducting the company's production activities so the pandemic situation will not pose significant obstacle to the company's production processes. To resume its production processes under the necessary health and hygiene protocols amid the pandemic, Pindad also continues to adhere to its existing environmental management principles amid its operations, while conducting community empowerment activities as usual. The company needs to only modify the time frame and implementation mechanism of these activities with the constraints brought by the current pandemic while still endeavoring to implement these activities effectively amid the constraints.

The paper will address several of the company's innovations in environmental management and natural resources utilization minimization programs, which comprise promoting energy and water efficiency, decreasing the pollution burden from waste water and emission, conducting recycling, reusing and reducing activities for toxic and hazardous waste, as well as the non-toxic and hazardous waste category, while still implementing community empowerment programs amid the pandemic. The company continues to run all the programs which belong to these pillars, while applying the COVID-19 pandemic-related safety and health protocols more meticulously. Pindad has also implemented several disaster mitigation programs both on regional and national level, as will be elaborated in the following sections:

An Overview of Pindad's COVID-19 Impact Mitigation Efforts on the National and Regional Level

The COVID-19 pandemic is a non-natural disaster which belongs to the medical disaster category. The pandemic has to do with an infectious virus. However, due to the wide-reaching socioeconomic impacts of the pandemic, COVID-19 has also dramatically impacted socioeconomic activities of people around the world, including Indonesia.

As an industry player, Pindad has also conducted several well-structured disaster mitigation and emergency response efforts, implementing these efforts into its industrial operation activities, as well as to locals living within the vicinity of the company's operational areas. By doing this, Pindad tries to contribute as a member of the industrial sector community to the nationwide disaster mitigation efforts. You can glimpse Pindad's disaster mitigation efforts in Picture 2.

Picture 2: Pindad's Disaster Mitigation Activities

Besides that, Pindad is also planning to conduct still several other non-natural disaster mitigation programs, as you can see in Picture 3.

Picture 3: Pindad's Contribution to the National COVID-19 Mitigation Efforts

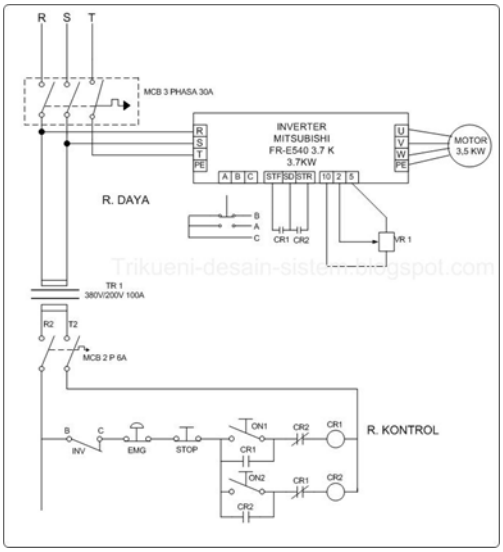
Pindad also attempts to contribute to the COVID-19 impact mitigation efforts on both the regional and national level by manufacturing supporting equipment for the healthcare sector to circumvent supply shortage amid the pandemic. This is part of the

children of the nation's innovations to drive domestic consumption while also helping the healthcare sector overcome the COVID-19 pandemic in a way which makes economic sense.

Hopefully, this would serve as a best practice role model for various industries around the world, especially in developing countries. These strategies work in boosting domestic goods production to bolster pandemic resilience not just in terms of financial benefits, but also by boosting the time efficiency of these goods' transportation and distribution processes.

Energy Efficiency Program: Promoting Energy Efficiency in High-Powered Induction Motor using Variable Speed Drive

The company also implements its energy efficiency initiative by using variable speed drive (VSD) in high-powered induction motors. Induction motor is one of the equipment frequently used in industries to propel various operational processes, including water pumps, compressors, funs, blowers, conveyors and many more, forward. Induction motor's popularity is thanks to its advantages compared to other synchronizer or DC motors, including its simple construction, durability, easy maintenance and high efficiency. Despite all its strength as equipment, however, induction motor also has several weaknesses, including a low-level velocity and initial torque adjustment. To overcome this problem, industries can just apply a control system, called the VSD, by adjusting the input voltage and its frequency to get a velocity and torque within the quantity needed by the industrial production process. The company documents its VSD use in Picture 4.



Picture 4: Pindad's Method of Applying VSD in Its High-Powered Induction Motors

Motor torque and velocity management are two important parameters of a high-quality induction motor. Users need flexible settings in these two variables by changing their inputs from 50 Hertz (according to the State Electricity Company or the PLN's standard) to the desired frequency to allow its motor to turn in the expected velocity and torque. This program contributes energy efficiency worth 0.8 GJ.

Emission Reduction: Eliminating the Weaponry Production Division's Tin Processing Chamber

Pindad's weaponry production division has a tin processing chamber which the company uses to polish the interior part of the weapons' barrels, using lead or black tin to complete the process. Unfortunately, in terms of work safety and health, workers' exposure to both lead and black tin could endanger their health and the company's awareness of the threat has prompted it to eliminate the barrel polishing process from its weaponry division. The company eliminates the tin processing chamber phase by replacing the chamber with a new machine which does not use heavy metal in its process, making it safer for its workers, besides being friendlier to the environment. The tin chamber process is being documented in Picture 5.

Picture 5: The Tin Chamber Processing

By getting rid of the barrel polishing phase, thereby removing the use of lead and tin from the weaponry manufacturing process, the company is also eliminating lead emission, which pollutes the air. In a nutshell, this program also plays a role in turning the weaponry production process into one which is environmentally friendlier by reducing the air pollution it causes.

Hazardous Waste Management: Using Rubber Gloves Instead of Sewn Fabric Gloves

To manage its toxic and hazardous waste, Pindad focuses mainly in reducing dominant type of waste, among others being fabric waste, from the sewn fabric gloves which its workers use in its daily operations. Technically, the company reduces its fabric waste by replacing the sewn fabric gloves with rubber gloves instead. Although manufacturing glove rubbers is more expensive than the sewn fabric ones, but the glove rubbers have longer durability than the fabric ones, thus contributing to the effort to reduce the toxic and hazardous waste.

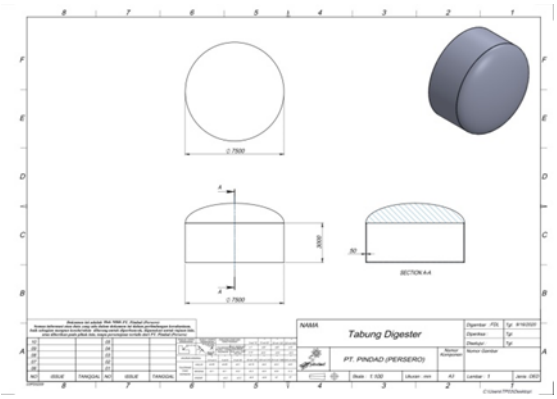
The rubber gloves are also safer to use among the field operators, because the rubber gloves have less likelihood of being stuck in the production equipment. How the workers use the rubber gloves in operational activities can be seen in Picture 6.

Picture 6: The Use of Rubber Gloves in Operational Activities

The material substitution program has been shown to be effective in reducing the toxic and hazardous waste pile with a 1:15 proportion compared to the sewn cloth gloves utilization. Considering that Pindad requires heavy utilization of these gloves across its various operational activities, the material substitution program has significantly reduced the toxic and hazardous waste pile.

Solid Waste Management: Bio-digester Equipment Design to Manage Organic Waste into Biogas

Biodigester is an equipment that the company uses to ferment organic waste, especially that of wet waste. Biodigester container functions to create an anaerob condition to ensure that the organic waste fermentation process will take place properly. The result of the fermentation process is a methane-containing biogas, which can be subsequently used as biofuel. Every day, Pindad's dining room produces organic waste from food scraps. The biodigester is expected to reduce the organic waste by turning them into biofuel which can be used for cooking. Pindad is making the biodigester machine as part of its innovation in organic waste management as depicted in Picture 7.



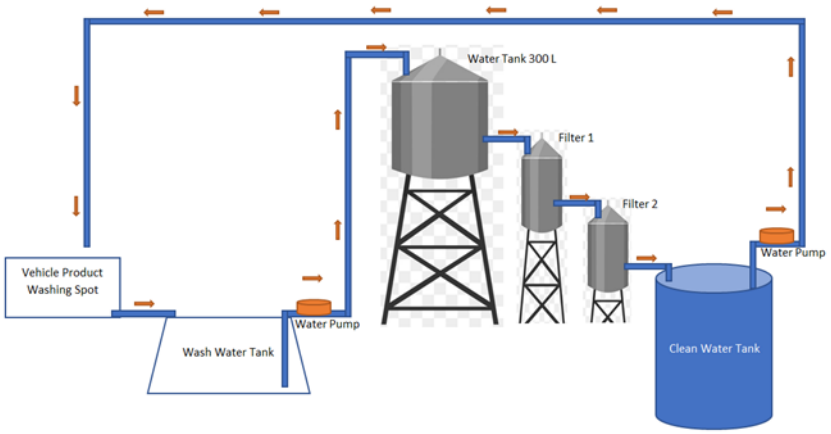
Picture 7: The Biodigester Machine, Made by Pindad, as Part of its Organic Waste Management Innovation

The program is still in its machinery design phase, yet the company has estimated that the new machine is capable of converting up to 39.8 ton of food scraps organic waste into biofuel per day. In the future, the company will move forward with its environmental management innovations in order to realize its contribution to the

manufacturing industry by managing the balance of its waste production. The company expects that the output of this program will be used in its Villages Go Gardening (locally known as *Kampung Berkebun*) initiative, which belongs to its community empowerment area.

Water Efficiency: Recycling Wastewater from Vehicle-Washing Activities

In terms of water efficiency, the company has a waste water recycling program, which recycles the waste water from its vehicle-washing activities in a water containment mechanism, which works by filtering the waste water before pumping it back to the reservoir to be used yet again in its vehicle washing activities. The company is conducting this program to optimize its use of clean water, which it sources from a groundwater well. The company filters out the wastewater from the vehicle washing activities to sterilize the water, specifically to prevent it from being mixed up with soapy water. A schema detailing the program implementation is featured in Picture 8.

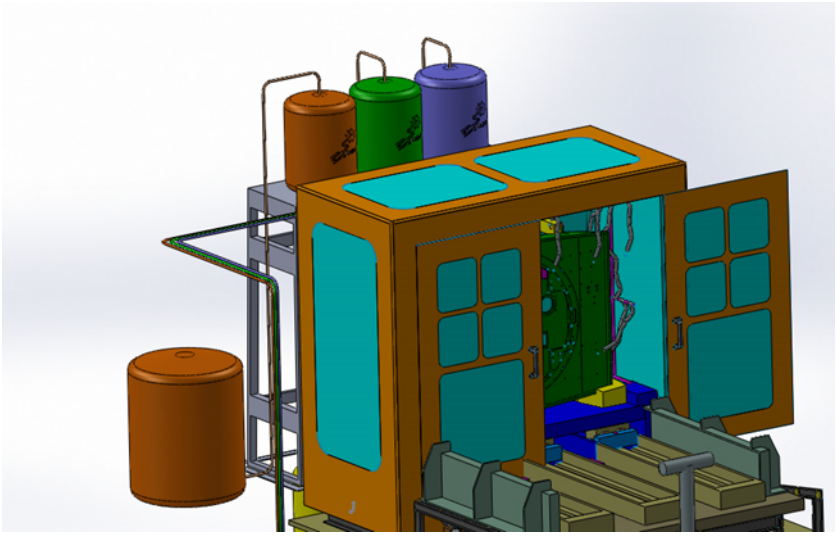


Picture 8: A Schemas Detailing the Recycling Process of the Wastewater from the Vehicle-Washing Activities

The program has been able to boost the clean water use efficiency by 30,384.00 cubic meters per annum from the company's vehicle-washing activities. This program also increases natural resources conservation as one of the company's attempts to support a global issue right now.

Wastewater Management: Fluoride Acid Chemical Material Recycling to Clean Aluminum Plates in Special Vehicle Components

One of Pindad's production process lines involve the use of fluoride acid as a chemical substance. The company uses the chemical substance to wash its special vehicle components and etchings as well as the vehicle's metal layering and convention coating. In its practice, the company innovates with the used hydro fluoride liquid circulation by still paying close attention to the liquid concentration. The whole process is depicted in Picture 9.



Picture 9: The Chemical Liquid Recirculation Process in Metal Plate Component Washing Activities

Through this recirculation program, the company can implement its waste water pollution from hydrofluoride chemical liquid reduction program. Currently, the program has been recorded to bring down the pollution burden by 0.2 tons of hydrofluoride per annum. In the future, meanwhile, the company will continue to increase its innovation programs to support its sustainable environmental management in the manufacturing sector.

Biodiversity Conservation: Conserving Squirrel Population in Pindad's Urban Forest Park

Pindad is also implementing several in situ biodiversity conservation programs by managing and maintaining the biodiversity of an urban forest park located within its operational zone. One of the unique programs which the company has consistently been implementing is conserving the regeneration of squirrels in the area. Based on the company's monitoring activities, it has discovered that squirrels in the area contribute to the plant fertilization through its manure, boosting the fertility of productive plants.

Therefore, Pindad has turned the urban forest park into a natural squirrel conservation zone. You can see the squirrels in the area being depicted in Picture 10.

Picture 10: How Squirrels Live in Pindad's Urban Forest Park Area

Based on the company's field monitoring activities, it has discovered at least 125 squirrels living across various corners of the Pindad urban forest park. The company has not conducted any specific surveys to map out the exact population number of the squirrels yet and has included these surveys into its future sustainable improvement agenda.

Community Shared Value and Development: 'Kampung Berkebun', an Organic Urban Farming Program in Bandung City's Suburban Area

Pindad's operational location in Bandung, West Java exposes it to a densely populated area, which majority of population belongs to the underprivileged socioeconomic bracket, marked by a lack of proper welfare. Keeping this condition in mind, the company has a potential to create added value both for the company's business itself and the communities living in the vicinity of the company's operational area. The company tries to tap into this potential.

In this case, PT Pindad has a land which it previously used as a landfill area but because it had proved to impact surrounding environment and communities negatively, the company finally decided to move the landfill area somewhere else, in cooperation with the local sanitation agency. To demonstrate the company's concern about its surrounding environment, it has come up with a community empowerment program to help local people make use of the land available in the area, to get additional income from various economic activities they can conduct over there.

The company organizes the community empowerment program by synergizing its team internally as well as collaborating with the local residents and the agricultural agency. The company's coordination activities with the RW 09 Sukapura neighborhood unit has resulted in the appointment of 15 local people to manage its *kampung berkebun* (villages go gardening) urban farming program, with one coordinator who also acts as a group guarantor.

Prior to implementing the program, the company has already signed a memorandum of understanding (MoU) with the RW 09 Sukapura neighborhood unit head. It has also conducted an urban farming training with representatives from the Bandung city agricultural agency.

To implement the program, PT Pindad has also provided land as well as an initial capital to fund the communities' urban farming activities. The company has also guided and monitored the local communities to help them turn the urban farming activity into a success. You can look at the local communities' urban farming activity in Picture 11.

Picture 11: The Implementation of the *Kampung Berkebun* (Villages Go Gardening) Urban Farming Program, Utilizing what Previously used to be a Landfill (*left*) into an Organic Farming Site (*right*)

Throughout the six-month program implementation period, local communities have been successful in harvesting at least seven vegetable types which they plant according to their harvest seasons. The economic benefits that the people have obtained from this activity are 2.5 times higher than the minimum wage set by the Bandung city administration. The total number of locals empowered in this program amounts to 15 people, whom previously were squatting around the landfill area. The local communities and groups managing the *Kampung Berkebun* activity have been benefiting from harvest produce, using the money they gain from it as a base capital to buy the plant seeds for their next urban farming activity.

Conclusions and Recommendations

We have concluded that out of the entire program conducted by PT Pindad to support natural resources conservation in its operational areas, the company has been successful in attaining several measurable benefits, including:

1. Energy efficiency worth 0.8 GJ per annum from the VSD program.
2. Reduction of the toxic and hazardous waste by 12 tons per annum from the use of rubber gloves.
3. Organic waste utilization worth 39.8 tons per annum using the bio-digester equipment.
4. Tin and lead emission reduction by 0.12 tons of particulate per annum by eliminating the tin processing chamber.
5. Attaining water efficiency by 30,384.00 cubic meters by recycling the wastewater from the vehicle-washing activities.
6. Reducing the hydro fluoride pollution burden by 0.2 tons per annum from its special vehicle activities.
7. Conserving squirrel species by 125 individual squirrels in the urban forest park area.
8. Empowering 15 people through the *kampung berkebun* (villages go gardening) urban farming activity from a field formerly used as a landfill area.

For the future success of Pindad's community empowerment programs, we would like to recommend that the company continuously evaluates and improves each program's implementation strategy, thus capable of producing innovations based on equipment technology, while still effecting significant environment benefits in terms of minimizing natural resource utilization.

Acknowledgement

We would like to deliver our gratitude and many thanks to the working group for environmental and sustainability of Pindad Manufacturing. We also thank to Board of Directors of PT Pindad (Persero) for their continuous support and guidance for the team to having concern in the environmental perspective. Other expression of appreciation also for the community for their kind of cooperation and vibrancy to develop their potential in a good environmental way is also part of the key success of overall teamwork. We wish to enhance the development of sustainability program in the future.

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