Damray | OA
Journal of Environment and Energy

2022, 1(1), 17-21

Environmental Impact Assessment of New Energy Batteries

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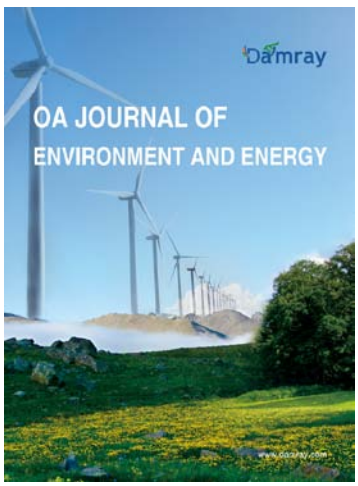

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OPEN ACCESS

DOI:
Received: June 27, 2022
Accepted: July 24, 2022
Published: August 10, 2022

Abstract

At present, the world's environmental problems are becoming more and more serious, which is also highly valued by leaders all over the world, and environmental impact assessment is also frequently mentioned. Because environmental impact assessment can promote the construction of ecological society, let more people participate in the protection of the environment and form the subjective consciousness of caring for the environment. China's rapid economic development has inevitably brought many problems, one of which is environmental problems. At present, the main problems are low public participation, information distortion and difficult to reach opinions, which not only affects social stability, but also causes great losses to sustainable economic development. At present, new energy vehicles have been fully developed in China. It is of great practical significance to fully analyze the impact of battery plants on the environment.

Keywords

Battery factory, environmental effect, assess, new energy

1. Introduction

This paper examines the potential environmental impact of using EV batteries as storage. Electrifying the transport sector is an inevitable step towards a more sustainable energy system to combat climate change mitigation. The mass deployment of large EVs increases electricity demand while presenting an opportunity to unite the use of EV batteries to shift peak demand to retired car batteries through vehicle-to-grid, battery replacement, and reuse. The environmental consequences of using EV batteries as energy storage are analysed in the context of the 2050 Energy Scenario. The results suggest that using an EV battery for energy storage through battery swapping helps reduce the environmental psychological impact of the survey; further reductions can be achieved by using retired EV batteries. This article conducts a series of investigations on a lithium battery manufacturer. In order to further study the impact of its production on the environment.

2. Pollution source analysis and corresponding measures

2.1 Waste gas pollution sources and treatment measures

2.1.1 The ingredients contain dust waste gas

In the batching process, lithium iron phosphate, lithium manganese or lithium cobalt, carbon black and graphite are put in, resulting in a small amount of dust. The data are as follows: the dust production amount is 0.7t/a, the settlement is 70% in the workshop, and the emission is 0.21t/a (0.044kg/h). The above data are estimated according to the raw material consumption of the project.

2.1.2 NMP exhaust gas

In the process of positive pole baking and drying, part of NMP evaporates and produces organic waste gas containing NMP. The equipment is equipped with NMP condensation recovery device + activated carbon adsorption. After treatment, the waste gas is discharged by 15m exhaust cylinder, and 96% of the gas can be eliminated. The air volume of the waste disposal system reaches 3000m^3/h, and the high concentration of waste gas can be produced in a single production line. After treatment, this data decreases from 2068.57mg/m^3 to 73.78mg/m^3, and the emission rate meets the emission standards.

The baking system of the coating machine is well sealed, and the unorganized emission is very small. According to the estimation of 3‰ of the material quantity, the unorganized emission of NMP is 1.3T /a.

2.1.3 Vacuum pump exhaust gas

During the operation of the vacuum pump, the rising temperature will lead to the rapid volatilization of the pump oil in the vacuum pump, and the volatilization gas belongs to organic waste. The main pollution source of this exhaust gas is total methane hydrocarbon, but because the concentration of non-methane is relatively low, it can be discharged by the exhaust cylinder of 15m.

In a single set of vacuum pump, the system air volume is about 252m^3/h. According to the test results, the concentration of non-methane total hydrocarbon generation is 1.38mg/m^3, and the rate is 0.0003kg/h, and the emissions meet the emission standards.

During the operation of the vacuum pump, the high temperature of the pump leads to the volatilization of a small amount of vacuum pump oil, which is an organic waste gas. The main pollutants are total non-methane hydrocarbons, which are directly discharged from the supporting 15m exhaust cylinder due to the low concentration of non-methane generation.

The air volume of a single vacuum pump system is 300m^3/h, the production concentration of total non-methane hydrocarbons is 5.05mg/m^3, and the production rate is 0.0015kg/h, which is similar to the equipment of similar domestic enterprises. The direct discharge meets the secondary standards of total non-methane hydrocarbons in Table 2 of Comprehensive Emission Standard of Air Pollutants (GB16297-1996).

2.1.4 Electrolyte injection liquid waste gas

Electrolyte Organic gas as an organic solvent, the main role is to raise sealing, lithium battery electrolyte components include diethyl carbonate (DEC), lithium hexafluorophosphate and so on. The exhaust gas is produced in the secondary lithium production, because the operation process is mainly operated by the automatic closed liquid injection machine, so only a small amount of organic exhaust gas is released.

2.1.5 Oil fume

If there is a kitchen in the canteen, and electricity is used as energy, the lampblack generated in the cooking process needs to meet the relevant standards. First, the exhaust hood needs to be collected, and then the lampblack purification facilities need to be purified. After completing these two steps, the lampblack can be discharged.

By analogy, it can be known that the concentration of lampblack is approximately maintained at the level of 15mg/m^3, and a set of combined lampblack purification unit is proposed to be used for treatment. The purification efficiency can reach more than 90%, the emission concentration is 1.5mg/m^3, and the exhaust emission is 10000 m^3/h. The minimum removal efficiency of medium-sized lampblack purification facilities should reach 75% in gb18483-2001 standard. After treatment, lampblack meets the requirements of the emission standard, and the relevant standard is 2.0mg/m^3.

2.2 Waste water pollution sources and treatment measures

There are many sources of waste water, mainly including the waste water that may be generated in the NMP waste gas heat exchange circulating cooling system, domestic waste water and stirring impeller cleaning waste water, etc.

In the production and operation process of the factory, the production of negative slurry and the waste water in the stirring barrel cannot be avoided. In this case, the waste water should be precipitated first and then discharged, because

there may be graphite, styrene butadiene rubber, sodium carboxymethyl cellulose and other pollution sources in the waste water.

NMP wastewater with main pollutants of COD and SS will have a decrease in discharge related content after treatment, and the output data is about 0.9 m^3/d.

In the process of preparing pure water, the generation of waste water is inevitable. After the generation of waste water, the plant drainage pipe network is carried out, and then the discharge is carried out after the integrated sewage treatment process.

Domestic sewage widely exists in office buildings, health facilities, dormitories and workshops in the factory area, and its main pollutants are COD, ammonia nitrogen and SS.

The waste water discharged to the sewage treatment plant can only be entered after the integrated sewage treatment by the unit in the factory. The waste water discharged from the wastewater treatment plant also needs to be discharged in accordance with relevant regulations. The discharge standard refers to the secondary standard of the Comprehensive Sewage Discharge Standard.

Sewage pollution sources and treatment measures are shown in the following table.

Table 2-1. Wastewater pollution source and treatment measures

pollution source	Wastewater volume（m^3/d）	pollutants	Concentration produced （mg/L）	Treatment measures	Emission concentration （mg/L）	whereabouts
Negative slurry transfer barrel and stirring paddle cleaning wastewater	3.3	COD	500	Sedimentation tank + integrated sewage treatment facility	COD 62 Ammonia nitrogen 12.8 SS 50	total outlet
		SS	800			
domestic sewage	132.8	COD	600	Grease trap/septic tank+integrated sewage treatment facility		
		Ammonia nitrogen	40			
		SS	200			
NMP exhaust gas heat exchange circulating cooling water system	0.9	COD	50	Integrated sewage treatment facility	62	total outlet
		SS	50		50	
Pure water preparation	0.5	COD	100		62	total outlet
		SS	150		50	

2.3 Noise pollution sources and control measures

The main noise pollution source of the proposed project is the mechanical or aerodynamic noise generated by high-noise equipment such as vacuum pump, air compressor, cooling tower, coating machine, etc. Similar to similar equipment, the project noise source intensity and control measures are shown in Table 2-2.

Table 2-2. List of engineering noise sources and control measures Unit: dB(A)

No.	device name	Quantity (set)	Strong noise source	run situation	control measures	Noise reduction effect
1	vacuum pump	6	75-80	continuous	Sound insulation for vibration reduction foundation workshop	Factory bound up to standard
2	air compressor	2	75-80	continuous	Sound insulation for vibration reduction foundation workshop	Factory bound up to standard
3	Cooling Tower	2	75-80	continuous	distance decay	Factory bound up to standard
4	coating machine	8	71-75	continuous	Factory sound insulation	Factory bound up to standard

From Table 2-2, it can be seen that the main noise sources of the project have taken sound insulation and noise reduction measures. After distance attenuation and building sound insulation, the noise at each plant boundary can reach the "Environmental Noise Standards for Industrial Enterprises at the Boundary" (GB12348- 2008) standard requirements.

2.4 Solid waste generation and treatment and disposal measures

The solid waste generated by this project includes productive solid waste and domestic waste. Among them, the productive solid waste mainly includes waste positive and negative plates, (positive transfer barrel) wiping rags, aluminum-plastic films, diaphragms and other scraps, as well as NMP waste liquid, waste activated carbon, etc., see Table 2-3 for the generation, treatment and disposal of various solid wastes.

Table 2-3. The production, treatment and disposal of various solid wastes when the project reaches production capacity Unit: t/a

No.	Pollution production process	Solid waste name	Output	Category and Code	Treatment and disposal measures
1	Production cutting	Waste positive and negative plates	4.6	HW49 other waste	Entrust a qualified unit to handle
2	Positive transfer barrel	waste wipes	4	HW49 other waste	
3	NMP Waste gas treatment	Waste activated carbon	18.2	HW49 other waste	
4	NMP Waste gas treatment	NMP waste liquid	99.75	HW42 waste organic solvent	Original manufacturer recycling
5	side scrap	Aluminum plastic film, diaphragm scraps	2	General industrial solid waste	Comprehensive utilization of outsourcing
6	Various living facilities	domestic waste	150	General solid waste	Sanitation Department Clearance

3. Environmental impact prediction analysis

3.1 Prediction and Evaluation of Ambient Air Impact

To predict the dust and other pollutants in the project, the atmospheric estimation model needs to be used. The following table shows the maximum concentration contribution of dust and non-methane total hydrocarbon fugitive emissions to the monitoring points of fugitive emissions at each plant boundary.

Table 3-1. Contribution of fugitive emissions to the maximum concentration at the plant boundary Unit: mg/m^3

factory boundary	East factory Boundary	South Factory Boundary	West Factory Boundary	North Factory Boundary	Monitoring concentration limit
Distance from fugitive emission source to plant boundary (m)	70	114	228	272	/
Contribution value of the maximum concentration of dust	0.0598	0.0632	0.06074	0.05754	1.0
Contribution to the maximum concentration of non-methane total hydrocarbons	0.02644	0.0281	0.02658	0.02622	4.0

It can be seen from the above table that 0.0632mg/m^3 is the maximum contribution value of the fugitive dust emission during the project implementation to the monitoring points at the plant boundary. Meanwhile, 0.0281mg/m^3 is the maximum contribution value of non-methane total hydrocarbon unorganized emission to the monitoring point of unorganized emission at the plant boundary. According to the above data, it can be seen that the treated waste gas emission meets the requirements of the Comprehensive Emission Standard of Air Pollutants (GB16297-1996) in Table 2. The

influence of dust and non-methane total hydrocarbon emission on the surrounding environment becomes insignificant.

3.2 Prediction and Evaluation of Surface Water Environmental Impact

The project adheres to the principles of "cleaning and diverting sewage" and "separating quality treatment" in the treatment of sewage, and the treatment of wastewater is carried out under these two principles.

Before discharging, unit integrated sewage treatment facilities in sewage treatment need to consider if the main domestic sewage need to refer to the relevant standards, relevant standards stipulated in the "sewage comprehensive discharge standard" (GB8978-1996) in the first standard.

A/O is an improved process that may be used in the treatment of secondary sewage, and this process is also relatively common in sewage treatment plants. When the sewage treatment plant treats with reference to the relevant standards, if the water quality meets the control standard and the A standard, it can be discharged into Baihe.

Before entering the plant, the wastewater from these projects will enter the sewage treatment plant according to the relevant discharge standards, and the flow direction after entering the plant will also strictly comply with the relevant discharge standards. Standard provisions refer to the "Comprehensive Sewage Discharge Standards" (GB8978-1996).

Through analysis, after the treatment of the integrated sewage treatment facilities in the plant, the COD discharge concentration of the total discharge outlet meets the first-level standard in the Comprehensive Wastewater Discharge Standard (GB8978-1996), and the project wastewater discharge volume is small, and doing so also, Surface water will not be affected because wastewater will not be discharged to the surface, so the impact on surface water will be minimal.

3.3 Prediction and Evaluation of Acoustic Environment Impact

High-noise equipment mainly includes vacuum pumps, cooling towers, air compressors, etc. These equipments have relatively stronger noise sources than similar equipment, with decibels between 71~80dB(A), through the efforts of various measures of noise reduction equipment, Noise in other departments such as workshops will be significantly reduced and can be maintained below 60dB(A). After the project is put into production, the contribution of noise sources to the day and night noise at the east, west and south plant boundaries all meet the requirements of Category 3 standards in the "Environmental Noise Emission Standard for Industrial Enterprise Boundaries" (GB12348-2008). Environmental impact is small.

3.4 Analysis of Solid Waste Impact

The solid waste generated by the project will be properly disposed of and recycled as much as possible to reduce the probability of secondary pollution as much as possible.

4. Analysis of Cleaner Production Level

The construction of the project needs to meet the relevant national policies and regulations, which not only requires advanced production technology, but also needs to reduce resource consumption, adopt energy-saving and water-saving facilities and technologies, and grasp the quality of production technology. In addition, effective prevention and control measures are also urgently needed for the various pollutants that have been discharged to minimize the discharge of pollutants. These two steps can be called process control and measure placement, so that industrial solid waste can also be recycled. Of course, the daily management of operations also needs to be strengthened to implement cleaning plans and maintain normal production and operation activities in order to meet the new concept of cleaner production and production activities.

References

[1] M. Leba, A. Ionica, R. Dovleac, R. Dobra. (2018). Waste management system for batteries. Sustainability, 10(3), (2018), 332.

[2] A. Mayyas, D. Steward, M. Mann. (2019). The case for recycling: overview and challenges in the material supply chain for automotive li-ion batteries. Sustain. Mater. Technol., 19 (2019).

[3] Lang Xiaoyu. (2020). Study on Environmental Impact Assessment of Waste Lubricating Oil and Waste Battery Centralized Storage Construction Project [D]. Heilongjiang University, 2020, (6).

[4] Zhou Ke. (2018). Public Participation in environmental impact assessment in Lujiang County-A case study of Anhui Qianchuan Power lithium Battery Project [J]. Anhui University of Finance and Economics, 2018, (4).