

Proceeding of the 1st International Symposium of Public Health

"Emerging and Re-emerging Diseases"



Editors

Sri Sumarmi

Ika Yuni Widyawati

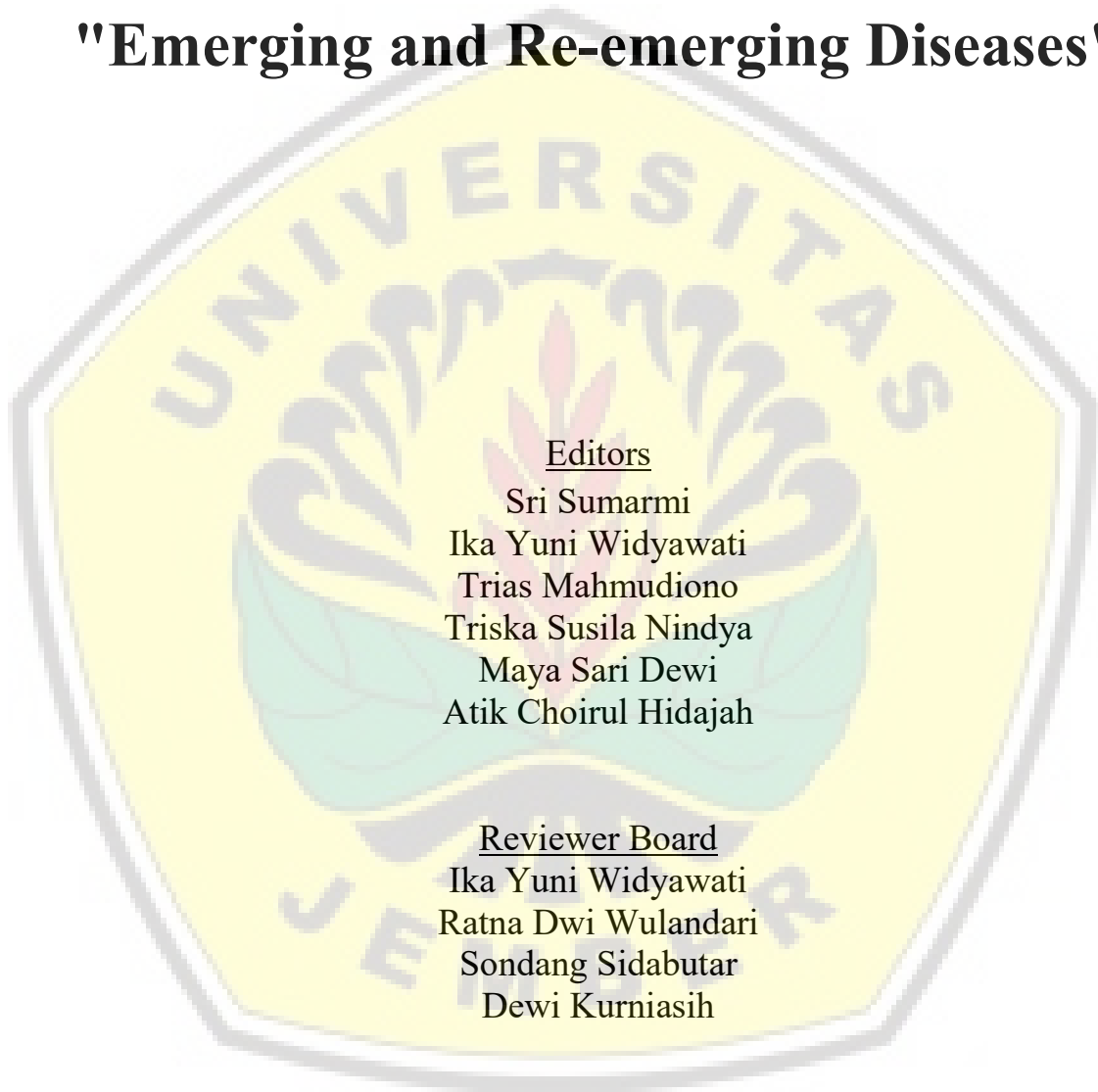
Trias Mahmudiono

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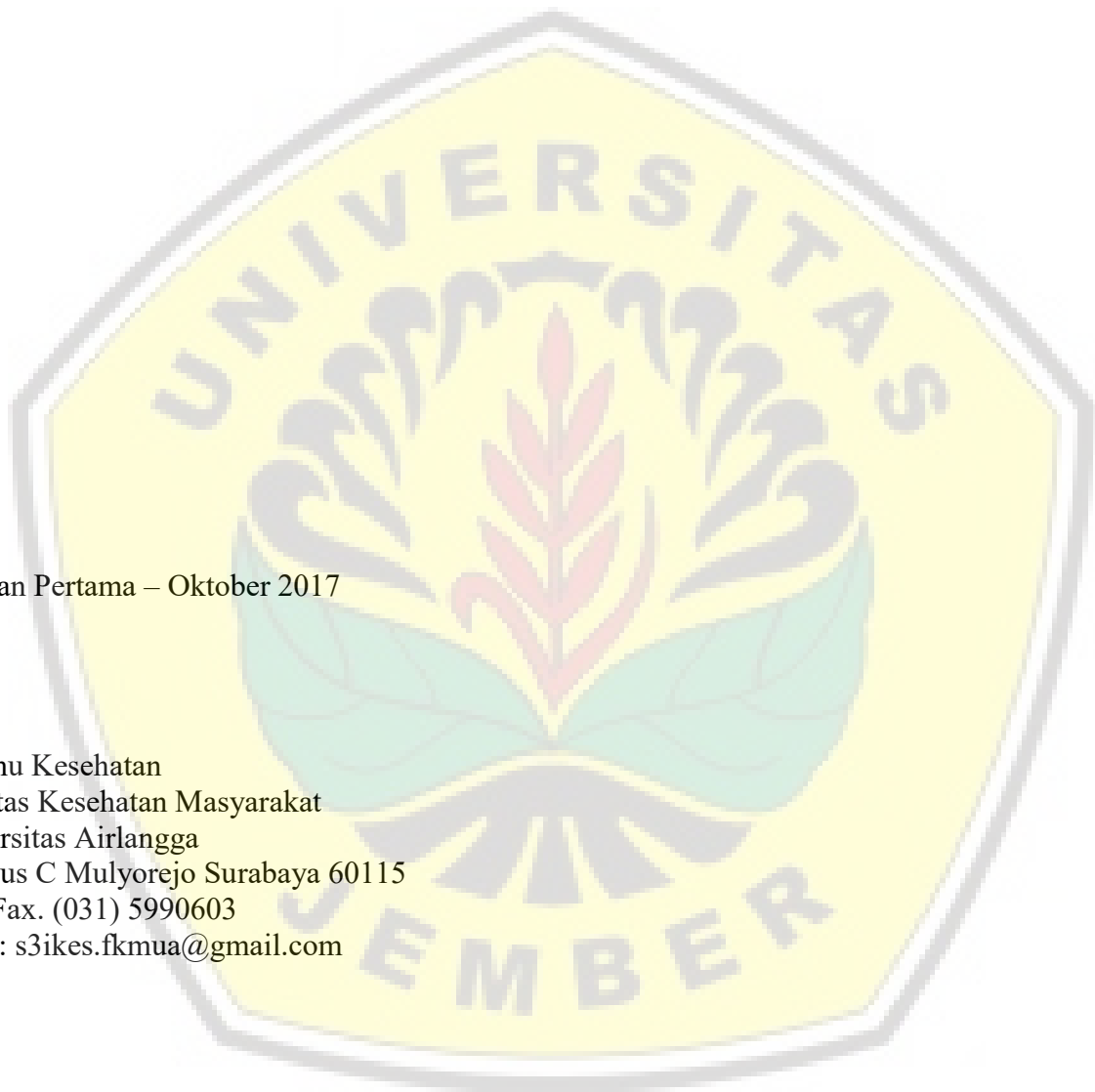
Ika Yuni Widyawati
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Sondang Sidabutar
Dewi Kurniasih



**S3 Ilmu Kesehatan
Fakultas Kesehatan Masyarakat
Universitas Airlangga**

Proceeding of the 1st International Symposium of Public Health, "Emerging and Re-emerging Diseases"

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WELCOME MESSAGE

Assalamu 'alaikum warahmatullahi wabaraqatuh

I wish you all a warm welcome to Surabaya Indonesia.

It is a great pleasure for me to invite you in the 1st International Symposium of Public Health, held by Faculty of Public Health, Universitas Airlangga. This remarkable event is conducted by Doctorate and undergraduate program of Faculty of Public Health, Universitas Airlangga in collaboration with Airlangga Health Science Institute and Smart FM Surabaya. It's an honor to present "Emerging and Re-emerging Diseases" focusing on Zika virus as the main theme of our Symposium, as Zika being a new emerging disease in asia region.

The aim of this symposium is to disseminate the strategic planning of Indonesian Government, particularly the Ministry of Health, to prevent the transmission of Zika virus as well as the global and regional regulation. In relation to this matter, we invite Minister of Health as keynote speaker and also foreign expert: Professor Cordia Chu from Griffith University, Australia, but, unfortunately in this opportunity Professor Chu with a great regret can not come physically to Surabaya, due to a combination of critical family and urgent business. Instead, she likes to nominate Mr. Febi Dwirahmadi, SKM, MSc.PH, PhD to share the scientific knowledge about managing and Handling Zika in Community Setting. We also invite Dr. Pang Junxiong Vincent from National University of Singapore, who are going to discuss about the epidemiology of Zika, as well as Professor Nasronudin to present the role of Universitas Airlangga in research development.

The committee also invite the audience to submit abstracts in several sub themes in public health areas. We are expecting of two hundreds (200) participants, with at least ten percent (10%) coming from foreign countries and ninety percent (90%) from local participant coming from various region in Indonesia. There are a hundred and seven (107) abstracts were submitted, and then eighty nine (89) abstracts were accepted. From the accepted abstracts, there are fifty two (52) abstracts were accepted as oral presentation, and thirty seven (37) are presented as poster. This symposium was devided into two sessions, the plenary session and panel oral presentation. It is designed in such way, so that the delegates from various countryies or provinces, could share their local experience and best practices and discover ideas for strong regional initiatives.

At last, we would like to acknowledge for all parties which are provide the valuable materials as well as financial support for the successful symposium. As chair of organizing committee, I would also like to say deep thank you for all committees; my colleagues, and also students in faculty of Public Health Universitas Airlangga, who have been working to be part of a solid team and amazing committee.

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To all of audience, thank you very much for your participation in this symposium, I hope you enjoy not only the symposium but also the sparkling city of Surabaya.

Wassalamu 'alaikum warahmatullahi wabaraqatuh

Sincerely,

Chair Person

Dr. Sri Sumarmi, SKM, M.Si





UNIVERSITAS AIRLANGGA

Rector's Official Address
in
INTERNATIONAL SYMPOSIUM OF PUBLIC HEALTH
"Emerging and Re-emerging Disease"
November 30, 2016

Assalamu'alaikum wa-rahmatullahi wa-barakatuh.

May the peace, mercy and blessings of Allah be upon you.

Alhamdulillah! Praise be to Allah and along with this gratefulness let us also send *shalawat* and *salam* to our Prophet Muhammad SAW (Praise Be Upon Him): *Allaahumma shalli 'alaa Muhammad wa 'alaa aali Muhammad*. May Allah give mercy and blessings upon Him.

Ladies and Gentlemen,

The world always advances along with its challenges including in medical field. There are emerging diseases which have just occurred recently such as the one caused by Zika virus. There are also re-emerging diseases for the ones we assumed have been eradicated but they occurred again such as measles and polio.

Special for diseases related to Zika virus, some countries have declared a state of emergency. WHO even declared Zika virus transmission in South America as international public health emergency. Regarding the matter, for the global Zika virus epidemiology development, we regret to learn that information on Zika virus is limited such as on the risks, diagnosis, and the transmission method of the virus. In short, Zika virus has continued to spread and become a global precedence.

Therefore, this "INTERNATIONAL SYMPOSIUM OF PUBLIC HEALTH" is very welcomed and I appreciated the theme, "Emerging and Re-emerging Disease". I believe the communities, academic or general public will achieve benefits from the symposium results.

Ladies and Gentlemen,

Through this symposium, we are expected to get explanation and updates on measures to handle the "Emerging and Re-emerging Disease". The explanation is expected to give new insights for us to improve the quality of life as the demand to better quality of life, free from diseases, is even higher.



UNIVERSITAS AIRLANGGA

Hopefully, this event works as an effort to spread the knowledge and also functions as an input for the policy maker in medical field.

I would like to express my deepest gratitude to all participants, either domestic and from other countries, also to the committee and other parties who support this international symposium. I hope that our active participations can bring success to this seminar and they are regarded as act of kindness.

By saying grace: "*Bismillahirrahmanirrahim*", I officially open the "INTERNATIONAL SYMPOSIUM OF PUBLIC HEALTH" on "Emerging and Re-emerging Disease".

May this symposium be a success, run well and all the objectives achieved. Let us advance together to a better life in all aspects, especially in Public Health.

Have a great symposium and continue success!

Wassalamu'alaikum wa-rahmatullahi wa-barakatuh.

Rector of Universitas Airlangga,

Prof. Dr. Moh. Nasih, SE., MT., Ak., CMA.
NIP. 196508061992031002.

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ANALYSIS OF AMMONIA (NH₃) EMISSIONS TREATMENT IN FACTORY PRODUCTION I PT. PETROKIMIA GRESIK

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ABSTRACT

Ammonia (NH₃) occurs naturally in low concentrations in areas that are not polluted. At higher concentrations, it would poison aquatic organisms present in a large scale. Toxicity of unionized ammonia will be higher if the low temperature and high pH. Ammonia concentration above 0.11 mg /L would pose a risk of growth disturbance in all species of marine fish, marine plants for the concentration of ammonia at 25 micromoles per liter causes of death. The purpose of this study is to describe the quality of emissions of ammonia (NH₃) in the exhaust stack emissions of ammonia (NH₃) in the factory unit I PT. Petrokimia Gresik, and to describe the effectivity of ammonia emissions treatment in unit Factory I PT. Petrokimia Gresik. The variable of study was quality of ammonia emissions and the effectiveness of ammonia emission treatment. This study was descriptive, using the method of observation. The result showed that the concentration of NH₃ per month was still below the quality standard of the Environment. Their emissions scrubber system, especially in the processing of NH₃ gas in Urea Plant to reduce concentrations of NH₃ are released in the air, so that the ambient air quality is maintained and does not cause negative effects to health and the environment in residential PT. Petrokimia Gresik.

Keywords: Treatment, Ammonia (NH₃), Emissions

INTRODUCTION

PT. Petrokimia Gresik (PG) is a company status State Owned Enterprises (SOE) within the Ministry of Industry and Trade is engaged in the production of fertilizers, production materials using chemicals (H₂SO₄, H₂PO₄, CO₂, etc.) and production systems that use heavy machinery. PT. PKG is the second oldest fertilizer plants in Indonesia after PT. Pupuk Sriwijaya (PUSRI) in Palembang and also a complete fertilizer plant among other fertilizer plant. PT. PKG has three (3) location of the plant, namely Plant I, Plant II and Plant III. Each of the factories have the production process and

produce different products. Factory I (nitrogen fertilizer plant) to produce Ammonia, ZA I & III, Urea, CO₂, Dry Ice and Utility. Factory II (Phosphate fertilizer plants) produce SP-36 1 & 2, Phonska, Tankyard Ammonia and Phosphate. While Factory III (Phosphoric Acid Factory) produces sulfuric acid, acid phosphate (H₃PO₄), Aluminium Floride (AlF₃), Cement Retarder and ZA II.

Ammonia occurs naturally in low concentrations in areas that are not polluted. At higher concentrations, it would poison aquatic organisms present in a large scale. Fish are the most sensitive species of ammonia concentration shifting in the waters. Water solution is in the form

of ionized ammonia (NH_4^+) or non-ionized (NH_3). Relative concentration of each type depends on several factors such as pH and temperature. Toxicity of unionized ammonia will be higher if the low temperature and high pH. Ammonia concentration above 0.11 mg / L would pose a risk of growth disruption on all species of marine fish, marine plants concentration of ammonia at 25 micromoles per liter causes of death (Riwayati, 2010).

According to the East Java Governor Regulation No. 10 of 2009 stated that the ammonia emission limit value of 500 mg / m³. According to the survey conducted in the factory unit I PT. Petrochemicals showed that the measurement of ammonia emissions on the environment Production Unit I PT. Petrochemicals conducted over three months which is done by the Laboratory of Chemistry Department of Process and Energy Control PT. PKG.

According to the results of air emission quality measurements by Technical Implementation Unit of Occupational Health and Safety (K3 UPT) in the chimney saturator ZA III 06 - E 301 A in April 2015 was 0.82, in August 2015 amounted to 213, and in December 2015 amounted to 147.9. From the value of the measurement results, it can be concluded that processing result of emissions of ammonia done by Production Unit reduce the levels of ammonia in the air effectively.

The measurement results showed that ammonia emissions is in accordance to environmental quality standard below 400 mg / m³ or ammonia emissions controlling in Production Unit I is quite effective. However, according to the survey conducted to the community indicated that there were community concern and public complaints related to the smell of ammonia. The spared of ammonia odor in the air can be effected by several factors, emitted, the atmospheric conditions, the distribution of wind, relative humidity, and the presence of a

leak in the pipeline processing of ammonia at the plant unit I PT. PKG. If this is not manage properly, it would have an impact on public health and air quality deterioration around the factory PT. PKG.

Ammonia in gaseous form is irritating to skin, eyes and respiratory tract. If it is inhaled, it will irritate the nose, throat and mucous tissue. Irritations can be induce of the concentration from 130 ppm to 200 ppm. At a concentration of 400-700 ppm can result in permanent damage due to irritation of the eyes and respiratory system Brief exposure tolerance has the maximum concentration of 300-500 ppm for half to one hour. Exposure to concentrations of 5000-10000 ppm can cause death (Bridgend & Stringer, 2000).

MATERIAL AND METHOD

This design of this research was descriptive quantitative study. The population of this study was all the workers who are in a stone quarry dishes as well as make the sample as much as 33 respondents. The purpose of this study was to describe the quality of emissions of ammonia (NH_3) in the exhaust stack emissions of ammonia (NH_3) in the factory unit I PT. Petrokimia Gresik, and to describe the effectiveness of ammonia emissions treatment in unit Factory I PT. Petrokimia Gresik. The variable of study was quality of ammonia emissions and the effectiveness of ammonia emission treatment. This study was descriptive, using the method of observation. The data was analyzed descriptively and presented in table.

RESULT

Quality Emission Ammonia in the factory I

Based on the test data quality emissions of ammonia production unit I carried out by the Technical Implementation Unit Occupational Health

and Safety (UPT K3) in chimney I saturator ZA 03 - E301 A, saturator ZA III 06 - E 301 A, chimney prilling tower and stack Dryer carried out on April, August and December 2015 revealed the following results:

1. Chimney Saturator ZA I 03-E 301 A
Based on Quality Measurement Results table 4.2 Ammonia Emissions in Chimney Saturator ZA I 03 - E 301 A was conducted in April, August and December 2015 to get results with the average of April 267 with a wind speed of 1.1 to 2.9 m/s wind direction to the south, in August 69.4 with wind speeds of 0.9 to 3.9 m/s wind direction towards the East, and in December at 16.77 with the of direction the wind speed of 0.98 to 2.88 m/sec wind direction to the Southeast.
2. Chimney Saturator ZA III 06-E 301 A
Based on Quality Measurement Results table 4.3 Ammonia Emissions in Chimney Saturator ZA III 06-E 301 A which carried on April, August and 2015 December showed an average of 0.82 in April with wind speed of 1.1 to 4.3 m/s wind direction to the south, in August 213 with a wind speed of 1.1- 2.8 m/s wind direction to the East, and in December amounted to 146.9 with the speed of 0.67 to 2.51 m/sec and wind direction to the Southeast.
3. Stack Dryer ZA I 01-D 303
Based on Quality Measurement Results in table 4 Showed ammonia Emissions

in Stack Dryer I ZA I 01-D 303 conducted in April, August and December 2015 had an average of 1.61 in April with wind speed of 1.2 to 3.2 m/s direction the wind to south, in August 18.4 with wind speeds of 1.2 to 3.9 m/s direction wind towards the East, and in December at 155.83 with the direction of the wind speed of 0.67 to 2.51 m/s wind direction in Southeast

4. Stack Drayer ZA III 06-D 303
Based Quality Measurement Results table 5 indocated ammonia Emissions in Stack ZA Drayer III 06-D 303 conducted in April, August and December 2015 had an average of 0.36 in April with wind speed of 1.2 to 3.2 m/s direction the wind to South; 65.9 in August with wind speeds of 1.3 to 4.6 m/s direction wind towards the East, and in December amounted to 155.7 with the direction of the wind speed of 0.82 to 2.71 m s wind direction to the Southeast.
5. Prilling Tower Chimney GB 301 B
Based on table 5 Ammonia Emissions Quality Measurement Result in 301 GB prilling Tower B conducted in April, August and December 2015 to get results withan average of 95.8 in April with a wind speed of 1.9 to 3.4 m/s wind direction to the North, in August 2.08 with a wind speed of 0.6-2.6 m/s wind direction to the east, and in December at 155.73 with the direction of the wind speed of 0.78 to 2.97 m/s wind direction to North West.

Table 1. Ammonia Emissions Quality Measurement Results in the chimney Saturator ZA I 03-E 301 A

No	Date / Month / year	Unit	Measurable levels				Speed	Wind direction
			1	2	3	Average		
1	02 Apr 2015	mgr/Nm3	351	356	94,62	267	1,1-2,9 m/det	South
2	05 Agst 2015	mgr/Nm3	64,4	69,1	74,1	69,4	0,9-3,9 m/det	East
3	02 Des2015	mgr/Nm3	157	138,9	144,4	146,77	0,98-2,88 m/det	Southeast

Table 2. Ammonia emissions quality Measurement Results in flue Saturator ZA III 06-E 301 A

No	Date / Month / year	Unit	Measurable levels				Speed	Wind direction
			1	2	3	Average		
1	2-april-2015	mgr/Nm ³	0,86	0,60	1,00	0,82	1,1-4,3m/de	South
2	2-agust-2015	mgr/Nm ³	205	202	231	213	1,1-2,8m/de	East
3	2-des-2015	mgr/Nm ³	147,9	139,8	156	146,9	0,67-2,51m/de	Southeast

Table 3. Result Ammonia quality Measurement emissions in Stack Dryer ZA I 01-D 303

No	Date / Month / year	Unit	Measurable levels				Speed	Wind direction
			1	2	3	Average		
1	2-april-2015	mgr/Nm ³	1,66	1,88	1,29	1,61	1,2-3,2 m/det	South
2	2-agust-2015	mgr/Nm ³	18,4	19,6	17,1	18,4	1,2-3,9 m/det	East
3	2-des-2015	mgr/Nm ³	18,4	152	172	155,83	0,67-2,51 m/det	Southeast

Table 4. Ammonia emissions Quality Measurement Result in Stack ZA Drayer III 06-D 303

No	Date / Month / year	Unit	Measurable levels				Speed	Wind direction
			1	2	3	Average		
1	02 Apr 2015	mgr/Nm ³	0,52	0,27	0,28	0,36	1,2-3,2 m/det	South
2	05 Agst 2015	mgr/Nm ³	60,9	63,6	73,0	65,9	1,3-4,6 m/det	East
3	02 Des2015	mgr/Nm ³	143,5	152,4	171,2	155,7	0,82-2,71 m/det	Southeast

Table 5. Ammonia Emissions Quality Measurement Result in Cehimney Prilling Tower GB 301 B

No	Date / Month / year	Unit	Measurable levels				Speed	Wind direction
			1	2	3	Average		
1	01 Apr 2015	mgr/Nm ³	68,1	110	109	95,8	1,9-3,4 m/det	South
2	05 Agst 2015	mgr/Nm ³	2,30	1,73	2,21	2,08	0,6-2,6 m/det	East
3	01 Des2015	mgr/Nm ³	154,3	145,7	167,2	155,73	0,78-2,97 m/det	Southeast

DISCUSSION

Ammonia Emissions Management Effectiveness

PT. Petrokimia Gresik in the fertilizer production process produces waste in the form of ammonia gas that include to a heavy metal group. Ammonia gas before it is discharged into the environment is managed properly so that it do not bring negative impact on the environment and surrounding communities. PT. PKG pass the management of ammonia emissions using Dust Scrubbing system. Scrubber can be defined as means of separating a solid particles (dust) in the air using the gas or liquid as a tool. Water is a liquid that is generally used in the process of scrubbing.

Scrubbing dust system is mounted on the top of the prilling tower to pick up

dust in the area of cooling air. Molten urea at a concentration of 99.7% by weight (including biuret) droplets in a prilling tower as granules after missed strainer and head tank at the top tower and is injected into the distributor-type "acoustic granulator". To keep biuret formation to a minimum, the system should be designed and operated with the intention of molten urea temperature is maintained slightly above the melting point of urea (132.7⁰C) and also to maintain a residence time as short as possible. Molten urea from the head tank is distribute evenly to the distributor. When it reach the tower, granular urea in contact with the air rises, so the cooling and solidification is achieved before fluidizing cooler at the bottom tower. Urea prill perfectly cooled with air conditioning that put fluidizing bed of fluidizing cooler. Urea prills are

collected and cooled in a cooler at the fluidizing bottom tower and over flow into the trammel to be separated from over sized urea prill. Over sized urea is dissolved with a solution of a dust chamber in the dissolving tank.

Product of urea prill is sent to the belt scale for weighing and then it sent to *battery limit*. Hot air from the prilling tower containing urea dust in the treatment of post dust recovery system. Spray nozzles and packed bed installed for air scrubbing. Then air is discharged into the atmosphere by the induced fan to prilling tower after droplets of scrubbing section reduced is by a demister.

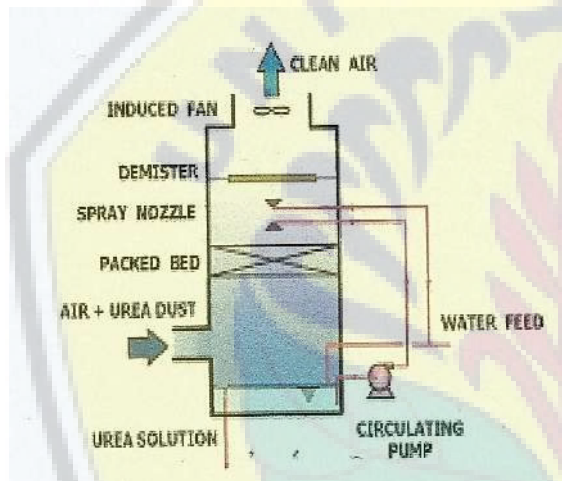


Figure 1. Dust circulation pump

Part of Prilling Tower

Dust circulation pump for recovery mounted on top of tower for circulating the urea solution from the sump to the packed bed for dust recovery. The concentration of urea solution is maintained $\pm 20\%$ by weight by setting the amount of water intake. Over flow pipes for the dissolving tank is installed to keep the solution sump. Finally urea dust emissions in the exhaust air of the tower is 30 mg/Nm^3 or less where the air meets solution pollution regulations *directly recovery urea to the urea solution*.

Scrubber system is an effective tool that to reduce the content of ammonia in

the gas. This can happen because ammonia is highly soluble in water, effectiveness of the ammonia content of the gas is influenced by the water used in the scrubber system. Duration in the scrubber system, and the content level of ammonia in the waste gas. If the water used in the scrubber system in a state of saturation, the water functions can not optimally work. The longer the ammonia gas in the scrubber system, the lower the content of ammonia in the gas, it is because the conditions in the scrubber system tends to damp the particles in the gas bound by water droplets so that particles with a separate gas. If this situation is repeated constantly in the scrubber system then it will decrease the ammonia gas levels to be more leverage. High or low content of ammonia in the gas also affects the effectiveness of decreased levels of ammonia in the gas.

CONCLUSION

Based on the analysis of the measured data the concentration of NH_3 in air emissions released in the production process can be concluded that the concentration of NH_3 per month is still below the quality standard which has been established by the Governor Regulation No. 10 in 2009 that is equal to $1360 \mu\text{m/Nm}$. Their emissions scrubber in the processing of system, especially NH_3 gas in Urea Plant can reduce the concentration of released NH_3 in the air, so that the ambient air quality is maintained and does not cause negative effects to health and the environment in residential. PT. Petrokimia Gresik should be carried out maintenance and checking of the air control device in a production machine regularly.

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