Transcript

Virgil

So, what got you into working with air quality?

Joseph

OK. Well first of all, I have a very strong academic and professional engineering background in civil and environmental engineering. I am a licensed professional engineer with an undergraduate degree in civil engineering from the University of Sierra Leonne, known as Fourah Bay College, and I also have double master's degrees in water resources from Germany and another master's degree in environmental engineering from Howard University and I finished in 1993. That's for the one in Germany, and then for Howard it's 2008. Upon completion of my graduate degree from Howard University, I started working here at NIH in the Division of Environmental Protection (DEP), having had lots of previous experiences in the water sector with different international, non-governmental organizations such as Doctors Without Borders and other organizations.

As a water engineer with different governmental agencies in different countries, I wanted this time to concentrate on air quality and pollution, which is another broad field of environmental engineering. This would enable me to have experience in this sector and then contribute to solving the air quality problems nationwide. My goal at NIH was to be more involved in the air emissions activities, to contribute to the objectives and reduction of air pollution problems, not only at NIH, but also in the surrounding area. We all know that air pollution vastly affects the quality of air and can cause damage to humans, plants, and animals as well. As a matter of fact, it is estimated that the combined effect of air pollution and household pollution is estimated with around 7,000,000 premature deaths annually.

Virgil

Oh my goodness.

Joseph

Yeah. So, when I started working here at NIH, I was assigned to work with my supervisor Mark [Miller] who was involved with the air emissions program by then. Under his leadership, I was able to learn and acquire a lot of experience from him and skills in this sector. The air emissions program involves a lot of calculations, and I'm very good and I like doing calculations. So that's what I like doing. Then in 2012, Mark became the Environmental Compliance Branch chief. And then I took over the responsibility of managing the air emissions program. So, for over 10 years I've been the air emissions expert and program manager for the NIH Bethesda Campus, which have been successfully managed. Though at times is challenging, I enjoy doing it.

Virgil

I just got to catch up with that here. That's always good that you can find a place that everything sort of comes together.

Joseph

Yeah, exactly. And it was, yeah, it was. Fortunately, I got into it and then met Mark and Mark has been very good and has directed me to the right thing to do.

Virgil

Great. Yeah. So then, since you're the main air quality person, what would a normal day in the office look like for you?

Joseph

OK. Well, the air program comprises of a variety of assignments encompassing a broad range of activities. A typical day in the office involves engaging in such activities, which would enhance the smooth running of not only the programs related to air emissions, but also to render assistance in other sectors in DEP when needed. Now the mission of DEP is to facilitate NIH research by fostering environmental stewardship, encouraging sustainability, protecting human heath, and safeguarding the air, water, and land. Part of my role at DEP is to ensure that the NIH operations and activities pertaining to the air emissions program are conducted in accordance with the environmental, federal, state, and local regulatory requirements and standards.

Now at the NIH Bethesda Campus, we have a five-year renewable Title V Permit, and it operates under the Code of Maryland [Regulations], we call it COMAR 26.11.03[.01], due to the fact that the actual NOx (nitrogen oxides) from the facility are greater than the major source threshold and this triggers the Title V Permit requirements in Montgomery County. So that means we operate on the Title V Permit. Which, for Montgomery, is 25 tons minimum for NOx. That's why we are a major source for air emissions. So as the subject matter expert and program manager for the Bethesda Air Emissions Program, and in collaboration with the other departments and stakeholders, it is my responsibility to ensure compliance of our emission sources with federal and state mandated emission standards with our Title V permits.

Moreover, I'm the point of contact with the regulatory agencies such as the MDE, Maryland Department of the Environment, and EPA. I also have additional activities, and these include participating in meetings and assisting [in the] interpretation of the Clean Air Act initiatives and requirements. I also provide any guidance and advice to other members of the ORF, Office of Research Facilities, towards implementation of those requirements. I conduct regulatory reviews and inspections of the NIH operations and construction sites to ensure that the NIH organization is implementing environmental health protection laws, regulations, policies, and permit conditions involving air quality. And I also provide technical assistance in environmental compliance. We also have lots of stationary sources like emergency generators, we have small boilers. For example, the emergency generators that are 500 or more kW per hour, they require permits, and we have lots of them here on campus. So, I prepare those permits for the previous emission sources: the boilers, generators and some other emission sources and then send them for review and approval by MDE.

I also keep records and then I prepare a lot of regulatory reports to MDE and EPA. I'll talk more about those reports as we go along. I also coordinate the biannual inspections conducted by MDE and that's in collaboration with the other departments. I get all the information from the departments and then we have a meeting. We do site visits but because of the COVID we just [inspect] the things required by MDE. So those are some of the other things. I work hand-in-hand with colleagues during audits and [within] NEMS, and emission activities with auditors. I'm also working with colleagues [within and

outside DEP, including] the Division of Technical Resources, DTR, DFOM, and then also [I] work hand-in-hand with contractors in other sectors. So, a typical day is very busy (laughter).

Virgil

(laughter) Oh yes.

Joseph

It involves either a sum or a combination of all these activities. Like for instance: yesterday, we had some incidents at the power plant. So, they always inform me. Then I do the investigation and write the report. I do that, then notify the MDE regulator and then I follow that with reports which I send to MDE.

Virgil

OK, so not only are you like, “we need to keep it constantly in regulation”, but also if any emergency thing comes up, you also have to deal with that too.

Joseph

Yes, yes, yes.

Virgil

Oh… wow!

Joseph

Yeah, anything that's happening.

Virgil

And so, just quick clarification personally: so the Title V Permit means that we're constantly over the normal amount of emissions, I'm assuming? Or, air pollution amounts?

Joseph

Well, no, no. We have like the NOx limits for the boilers and the Cogen: for the boilers, it's 81.7 tons per year, and then for the Cogen it’s 55.6 tons per year. That's the total NOx emission. But for over 10 years, we have never gone beyond that. For over 10 or 15 years, [we’ve] never gone beyond that. And now like the CEMS (Continuous Emissions Monitoring System) or the boilers, maybe when they are running or if they have some maintenance issues, they will have some problems. Maybe if they trip and go above the limits, which you are not supposed to go above. Not the 81.7 tons, but this is just like a limit which they have. So, if they trip, they inform me and then I send the reports to MDE. But the actual NOx limits for the Cogen, we are always in compliance for over 10 to 15 years. We've never had major issues or gone above the compliance limits. And the Title V is huge, it has a lot of other sectors. I will go into some of them.

Virgil

Sounds good. That's a lot of moving parts.

Joseph

Yeah!

Virgil

But good, I'm glad you're on the case. So, yeah, the next question would be why is air quality important to the NIH?

Joseph

OK. Well, first of all, air pollution is the contamination of [the] indoor or outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere. It can cause them respiratory or other diseases, and these are important sources of morbidity and mortality. Now, in accordance with our Clean Air Act, which is the United States Federal Air quality law that is intended to reduce and control air pollution nation-wide, the NIH Bethesda Campus is classified as a major source of air pollution. This is because it has actual or potential emissions at or above the major source threshold for any pollutants. Now this facility has several sources of air emissions, which include, the cogeneration plants, the boilers, we have 5 big boilers, we have chillers, we have emergency generators located campus-wide, both mobile and stationary emergency generators. We have ethylene oxide sterilizers. We have asbestos, we have greenhouse gases. We have small boilers, we have medical waste incinerators, we have underground and above storage tanks. We have government vehicles around and we have our Continuous Emissions Monitoring System.

As you can see, all these are emissions sources which need to be regulated and controlled, like the power plants that is located at Building 11. And the Central Utility Plant, which we call “power plant”, it has a 23-megawatts Cogeneration system and five boilers which supply the heating and a significant portion of the electricity on campus. And then it also has two auxiliary boilers which provide steam. They are located right in front of Building 11. So those: they provide steam if the existing 5 boilers and Cogeneration system are out of service. As a result of all these emission sources, which, if not controlled, could cause significant environmental issues and health problems, air pollution measures in accordance with our NIH Title V permits are implemented to ensure compliance of all these emission sources. So, in effect, air quality or air pollution control measures are implemented at the NIH Bethesda Facility in order to prevent environmental and health problems.

Virgil

Yeah, that would be ironic. If us as the NIH we're making health problems (laughter).

Joseph

Right, exactly (laughter). That's why we have to really monitor and control all these emissions sources and if there is anything that happens, we have to report it immediately to the state, like if there is visible emission on campus. At times, the neighbors would call MDE [directly], “Oh, we've seen some smoke.”

Virgil

Oooh…

Joseph

Yeah, that used to happen before.

Virgil

Yikes (laughter).

Joseph

But now things are really better.

Virgil

Well, you were mentioning that used to happen before; could you give us a little bit of NIH's history around air quality?

Joseph

The NIH Bethesda Campus is a federal government and biomedical research institution that is located here in Bethesda. It consists of a large research hospital, labs, animal holding facilities, support facilities, Central Utility Plant, to name a few. As I mentioned earlier, this Central Utility Plant consists of 5 boilers, 12 chillers, Cogen that supply the heating and significant portion of the electricity. All these need to be regulated and NIH has taken compliance measures to control our emission sources in order for them to comply with their Title V Permit. Like the methods to determine the compliance and emissions control of these sources like operational limits, as I mentioned earlier on the boilers have a tonnage of 81.7 tons, that's the five boilers, they are not supposed to go above that. And then the Cogen is 55.6 tons per year, they are not supposed to go above that.

So, we always make sure that we come in [under limit] for all the years, we are always below those limits. And then the monitoring is another way that we [stay in] compliance, which is also in the Title V Permit. We monitor the boilers to ensure that they are all in proper operation and do not smoke. Then, whenever they operate on oil, we do visible emissions from them, because our boilers are primarily natural gas as of late. They have now been [used] as natural gas boilers. However, if there is curtailment, they will go back to oil during the curtailment time until the situation [resolves]. Reporting compliance is another one that we use. If there is excess visible emissions or deviation from the permits, that's something that we need to report. Then I take the measures of preventing them, include them in the reports, and notify the state.

For the fuel oil: sulfur dioxide is another pollutant that is very harmful to us and causes a lot of air pollution problems. These are from [the] stationary sources, like the power plants, the emergency generators, and the boilers. The fuel receipts need to [show we] operate on low sulfur content in that department. So, whenever they supply us our fuel, we ensure that it's low sulfur content and even when I'm writing the reports to the state, I include those receipts and copies of the certification to ensure that they are operating on low sulfur. We also use the low NOx burners. And then Boiler 5 is equipped with low NOx burners and a flue gas recirculation system and that reduces the NOx.

We have the CEMS, the Continuous Emissions Monitoring System, that was installed here at NIH sometime in 2019. Yeah. In the past, every two years, we used to do stack testing for all these NOx for the boilers, but with the continuous emission system, that one has now been eliminated, which is very good, and we get accurate results from it. Then we quantify the facility-wide greenhouse gases. I do that for MDE and then Jaro [Sebek] does that for EPA. We use different emission factors to calculate what our emissions are.

We also do annual testing for the CEMS, boilers, and also the Cogen. It's Relative Accuracy Test Audits, we call it RATA, which is done annually for both the Cogen system and the five boilers. That's just to ensure that the boilers and Cogen are operating properly. And then we also have these emergency generators that are located all around campus, with visible emissions. You also have training records for all of these the boilers, the Cogen, the emergency generators. The operators must be trained and they must have their training records. And then we also have the tank maintenance that is done for the year; underground and above storage tanks. We also have semiannual fuel inspections and they provide me with all those records. And then I use them in the calculation of annual emissions certification reports.

Virgil

So you must really like calculations then! (laughter)

Joseph

Yeah, yeah, yeah, it's a lot! (laughter)

Virgil

Phew, that's intense.

Joseph

It's intense. The calculations, I'll talk about that. It takes me almost four months. There is a report that they call the emission certification report. We have to quantify all our pollutants, like the material pollutants, we have the toxic air pollutants, and then we have the hazardous air pollutants, all those, each of them has to be calculated for all the emissions sources. I do that by getting the fuel data from the various sectors: the power plant, different generators, and all the other sectors. At the beginning of the year, they provide me with the fuel consumption for all these emission sources, so I use those and fuel consumptions to do all these calculations and it takes me almost 4 months.

I usually work during weekends, I work extra hours. When I just took over from Mark, I used to stay in the office at times [until] 8-9[PM] in order to complete the calculations on time. Even now that I'm used to them, it takes beyond three months because the deadline is April 1. So, I get the fuel consumption at the beginning of January. Since that time has started, I will work on it until the end of March and then I submit them before April. Yeah, it's a lot of calculations!

Virgil

I can't imagine it. (laughter)

Joseph

That's why you see me always sitting down here! (laughter)

Virgil

Man, just having to sit down and do the same math problem for months!

Joseph

Right, yeah, it's a lot!

Virgil

That's impressive. So, you've had all this stake into the game with air quality and things. Over the years, what have you observed to be NIH's strong areas with air quality and what are some areas we can improve in with air quality?

Joseph

Well, one of the things is I have very good collaboration within and outside DEP. The teamwork is great within DEP, and everybody is always willing to assist. Also, one of the strong areas, as I mentioned, [is compliance with] the permits: for over 10 years, we have never gone above, in fact, we have far below the 81.7 tons for the boilers and 55.6 tons for the Cogen. And then also as I mentioned the CEMS we have, which was installed in 2019, that one is very good because it is an efficient way to monitor stack emissions on continuous basis, and this system provides the EPA with data needed to enforce mandated reductions in the amount of pollutants emitted. Now prior to the CEMS, they used to do it at the power plant manually. So I would start working on the emissions certifications report, then I would observe down the road that there were some missing values, then maybe one month down into the calculations, I'd need to go back again and start again.

Virgil

Oh no! (laughter)

Joseph

(laughter) So I'll be in the in this office until maybe 10 o'clock at night, yeah! At times, I used to be here at 9 [or] 10, because it happened on a regular basis in those days. But with this CEMS now, the records are accurate. So, even though I spend a lot of time, I know that I don't have to come back to make changes and it's accurate. And then as I mentioned also the collaboration with the other departments like CUP; the person in charge of the CUP, Joe Nieves, I've worked with him since I started here, and he knows the information that that I need. Anytime there is something, they are quick to inform me! So we are very good at collaboration.

Areas that I want to see improved is creating awareness about the problems associated with air pollution. Not only outdoors, but also indoors. Because I realize that a lot of people don't know about the problems associated with air pollution. I also just read about it before [today], even though I'm an engineer. But I only knew when I started working and dealing with it, so educating people will go a long way and that will contribute to reducing the health problems associated with the operation.

Virgil

That's pretty good. I have to say, I'm glad we have the monitoring system in this.

Joseph

Yes, yes, yes, it's very good.

Virgil

And hopefully, this newsletter that we put out will help with that awareness part too.

Joseph

Right, exactly.

Virgil

Looking forward to the future, what would the NIH need to have a good future with air quality, and what do you think a good future would look like?

Joseph

[Improving] the education about air pollution because we need to create that awareness. And as you're rightly saying, this newsletter I'm sure will go a long way. And then, decreasing the use of fossil fuel is one thing also that can contribute to the reduction of air pollution. That's why we have all these air pollutants, the criteria pollutants; NOx, SOx, carbon monoxide, all of those are created by these stationary sources and mobile sources. So, decreasing the use of fossil fuels can contribute to the reduction of air pollution. Also, we have these alert days, like during [high] ozone period days. It would be nice for that to be circulated to people around so that they will know. That can help people become aware so [they] can limit their movement. And there are simple things like switching off the lights, fans, [or] heat when we are leaving the room. Those are basic things that we need to do. Also, we are talking about these electric cars; that would limit the use of fossil fuels that contribute to air emission problems.

Virgil

Perfect. That's the stuff that we're leaning into anyway, with DEP, so that's good!

Joseph

Yeah, right!

Virgil

And then this last question here is pretty much: I go into all of these interviews with just my perspective and you're the subject matter expert. Maybe there's something that you wanted to talk about that I didn't have up here. Is there anything else you want to share?

Joseph

The boilers, which are natural gas, during curtailments, [it is] fuel oil that is burned. And also, as I communicate with the state and EPA, one of the major things that I do is sending reports to the states. And the reports are so big, like these ones.

lifts a large binder filled with paper

Virgil

My goodness.

Joseph

I send these reports [on a] quarterly basis. I send reports of continuous emissions for the boilers and the Cogen units on the quarterly basis. Then semiannual reports of all the emission sources including amounts of oil, excess emissions and deviation. For instance, if we have deviation: when it occurred, what was the cause, and what are the remedies that we will take to prevent it from occurring again. Those are things that I need to include in the reports. We have the annual certification report, the deadline is the 1st of April, so that's submitted along with the emission certifications report. The compliance certification reports is for all of the air emission sources, all of them must comply with our Title V Permit. So I need to indicate that if there is anything that is out of compliance, and I need to see the reason why it is out of compliance. But so far, we've always had all of them operating in compliance.

And then we have the annual emissions certifications reports also. I have to calculate all the air pollutants for each and every emissions source. Another thing about that report, the air emissions and certifications report, it's used by EPA. Those calculations, EPA and MDE checks them thoroughly to ensure that they are done accurately. And then they use those calculations to certify our emissions for the past year. And these certified emissions are used for inventory and for billing us. So, the following year, after presenting all the reports in April, by May or the end of April, they send us a bill based on the quantity of pollutants. They use that to bill us, so it's very important. We talked about the CEMS, which is very advantageous, it has provided EPA the data needed and it's a very accurate data. So that's another thing.

Virgil

Well, that was fantastic. Thank you for sharing.