Decarbonising Buildings

The importance of connected lighting control in decarbonising buildings

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Lighting accounts for roughly, 36% of a building's energy, and thus carbon. The type of lighting used and the control strategy used to optimise its use can play a major part in decarbonising your buildings.

Figure 1. Automatic lighting control systems using data according to the estimation method of the Standard EN 15193-1 (Energy performance of buildings – Energy requirements for Lighting).

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Head of Enlightened in Europe, which is an IoT business of Siemens.

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Product Manager for connected lighting in SSE Energy solutions

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James Lane

Senior Solutions Architect at Honeywell Building Technologieslio range.

In this webinar, the panel concentrated on connected lighting control, rather than the light fittings themselves

Aimed at consultants, specifiers, FM professionals, and building managers, our cross-industry panel discussed practical considerations around using lighting control towards the decarbonisation of buildings.

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Transcript

Good afternoon, and welcome to our 10th Decarbonising Buildings webinar, The Importance of Connected Lighting Control in Decarbonising Buildings.

This afternoon we are going to concentrate primarily on connected lighting control from the viewpoint of energy efficiency, energy savings and decarbonisation, but we will also touch on the other benefits of connected lighting control.

The romantic version of what we do is turning buildings into sensing, thinking, entities with one goal in mind, making our lives better, easier, faster, and our gateway to lead this change is lighting and lighting controls, hence me joining me here today. Happy and excited to be with you.

We aim to provide you with some stimulating and thought-provoking conversations, the five subjects that we'll cover,

- Why is connected lighting important
- How can it help towards decarbonisation
- Other benefits associated with smart and intelligent lighting controls
- Some available technologies.
- First steps and the challenges

So, that's the format, for the afternoon, and we're going to run for about an hour.

Why is connected lighting important? For me, connected lighting is important from the viewpoint that lighting, really accounts for a significant proportion of the energy usage of commercial buildings, and in that respect, controlling that lighting so that it is only on when necessary, can add significantly to the decarbonisation and the energy savings of that building.

James, do you want to add some thought to that, why it's important, and where we go with it from there?

It's very important that we try to supply a solution that is an open protocol solution, that we're not working on a system that has a closed protocol, by which I mean that the manufacturer of that product uses their own proprietary software and communications bus.

The main reason why this is, many manufacturers lock their systems off, meaning that you wouldn't be able to get any credentials from that system and it is locked down to what their system can actually do, and it won't talk to any third party system. This could potentially be costly when it comes to the manufacturer supplying their in-house commissioning team for site visits.

There is also very limited manufacturer resource at the moment. So if you haven't got multiple systems together, which are all open protocol, where you can potentially use different devices, that potentially could be a problem. Also, with a closed-protocol system extra gateways are required, so that's extra forms of hardware added on to this proprietary system.

So what we want to try to do moving forward is keep everything as open protocol as possible, but most importantly, the reason why, is that if legacy equipment is discontinued it will potentially mean that the whole system needs replacement.

I want to give you a few key benefits of why we want to be using an open protocol system connectivity.

- This is suitable for importing and exporting data directly from the controller, so obviously, we don't need a third-party piece of hardware.
- Automated to control, the HVAC and room conditions can be done via a standard PIR (Passive Infra Red), meaning that that's reducing the hardware on-site from one system to another.
- We can also do complete centralised, monitoring, targeting, and display and control of the data from a single head end.

Thank you, James, for that input, Niko, I think you've got some thoughts about the human-centric aspects of that.

One quick thought is the following. We should never forget as will get infatuated with technology and we are after the latest and sexiest and all the great things technology can do. We should not forget the obvious. Wherever we have lights, we have without exception, human beings, that's why we have lighting in the first instance, so, there's a direct correlation. Now, why is this important?

It's important because it opens a new set of opportunities which I will cover later on.

So, the only thought I'm going to put, there is, remember, It's as much about people as it is about lights.

I think James covered it extremely well. I think that, as opposed to unconnected lighting, connected lighting gives you now such a breadth of opportunity. More so now in the last couple of years than you've ever been able to do previously.

And it's not just lighting itself and making lighting

as efficient and human-centric as Niko has said that but it also the ability now to share some of the information that's in lighting, with other systems. This has never been more prevalent than it is today.

Leading on then, potential carbon and energy savings, where can lighting control add to and embellish the decarbonisation piece? Simon, if you want to carry on from there and start talking about some of the numbers we can see on the screen here.

It really does come down to the difference between connected and not connected lighting. Just by connecting a PIR, you can see that you get a 50% energy saving. With a PIR able to share information with as many luminaires as possible, that initial jump in terms of energy savings is huge.

Looking at multiple systems, such as HVAC, lighting, security, CCTV, and fire alarm; if we can make that all intelligent, all talking the same language, we can bring all that back to a single head end, giving us our single pane of glass. This is obviously a lot easier for monitoring, for full control, with less hardware on-site, potentially a single PC/server, nice and easy to run and easy for remote access. The end user doesn't need multiple hardware solutions and multiple logins.

With regards to the slide, this relates to EN 151931, which is the energy performance of buildings, and energy requirements for lighting. So, this is an estimation method which I used to create this slide here, but please bear in mind that this is only an estimation. It is people-centric and building-centric.

On the first line you see no dimming, just LED, lighting with no user control.

If you then move on to the next one (manual dimming) you've got potentially a 25% savings. By using a central switch, on/off, dim up/down, you should get a 25% savings.

If you then integrate a proximity infrared sensor, which does presence detection that allows a 50% saving when using manual dimming as well.

And then if you then integrate a proximity infrared sensor, with Lux sensors, and daylight harvesting, if there's enough light level coming in through the window, the lights will automatically dim down, which should give you a 60% reduction.

If you then connect all of these using daylight linking, dimming, and the PIR functionality, you should get around 75% energy (and carbon) saving.

So it is very beneficial to be using proximity infrared sensing, using really good quality drivers that give you the maximum amount of data points so you can import and export as much data as possible into full monitoring on the 'single pane of glass'.

As I said previously, lighting does account for a significant portion of energy use, particularly in commercial buildings; the sort of buildings that we're talking about here: education, health care, commercial, and office space; these sorts of building.

Nicos, I know you've done some work around the percentage of energy use and looking at significant savings on energy and carbon, across a lighting system and how that relates to the quantity of energy we're talking about in respect of the whole building system.

There are quite a few studies out there, and we know that roughly 36% of the energy used in a building is used for lighting, although this can vary a lot, depending on the type of the building. For example, it can be as much as 80% in a warehouse. In office lighting, the situation is about 33%. However, this is only one part of the story because this is what we can directly measure, What we cannot easily measure is the decarbonisation effect of how much energy we're saving, because people are more efficient and functioning in a better way because they have the right lighting

Two years ago we couldn't do this because there was no technology to allow it. Now we have that technology in both the systems and the drivers and the energy model so we can provide the right lighting. This can make a huge difference in many sectors, such as in manufacturing, health, and education, and that is something that is not directly measurable, but there is definitely a positive effect with the right lighting.

So let's talk about taking significant moves towards the decarbonisation piece. I think we're talking about controlling the lighting and the lighting levels in a building. Niko, you and I have had some discussion around the human-centric piece, and I think you mentioned this earlier; just switching lighting off, can save an awful amount of energy, but it also could render the building unusable, and there is that balance between the two. We're helping towards the decarbonisation piece, but we're also mindful of the human interactive piece of the building as well.

Yes, there is a narrative, as I said earlier, that is as much about human beings as it is about lighting. So let's make this assumption. Let us assume that at the light fixture level or the control level, there's some type of intelligence that is adequate in order to understand how human beings anonymously behave within the space. That could allow us to drive some conclusions and adjust the space accordingly to be able to facilitate them better.

So we move away from just lighting controls, to understanding how the space has been used and I have a couple of stats and examples that I'm going to keep for later because I'm getting so excited and passionate about the whole human aspect. I don't want to rush it in slide 2 because it's very important to list, first of all the decarbonisation aspects, but I reserve the right to get back to this shortly.

I've worked across the BMS controls and the lighting controls sector in various businesses in my previous employ, and I think one thing that was always apparent to me was if there are people in the space then generally you require lighting, and then hence the lighting becomes a much more reliable link to the use of the building, and if then we can use the lighting control system as a much more quick-acting element of that control. Maybe we couldn't double up on the decarbonisation piece by actually interacting with other controls in the building better. So not only are we talking about lighting control just in terms of light levels or whatever, we can use that because it's so much faster reacting than traditional building controls. If we can use the lighting control, to reduce the lighting energy we can link that to other functions in the building, where humans are interacting. For instance, if we don't need heat, the lighting control is much more accurate than traditional building controls to some degree.

I'm just going to take on the point that you made earlier James and like yourself Bob, I used to be in the HVAC business myself in BEMS control before I joined Tridonic. I have to say that in all those years I was at Schneider Electric there were many opportunities where I really wanted to get lighting and BEMS working together. Because of all the systems in buildings, the two most prevalent, where people, are, lighting and HVAC. And I would say quite confidently, probably up until about 2 or 3 years ago, it was extremely challenging to share data out of lighting. That fast-acting presence and absence data that you were talking about, Bob, it was really, difficult for lighting companies to share that information with other systems. What changed was that at the end of 2019 to the beginning of 2020 lighting went from DALI to DALI2. The most obvious part of DALI2 was about standardisation around sensors, but there were also some other fundamental things which helps this whole subject matter about decarbonisation. One of the things was that DALI was a broadcast system, as opposed to a central application controller type system which DALI2 is, and which is the same as a BEMS Controller: a BEMS controller is an application controller with all the logic within the controller. It controls valves, sensors, fans, chillers, boilers, et cetera. DALI2 turned the lighting controller into the same thing.

In many cases, most systems, are the open systems that James spoke about earlier, which can now sit on the same network, and share the data quite a lot easier. Lighting data I'm talking about here, whether it be presence or absence.

Through the emergence of APIs, they can easily share, even BACnet interfaces. So a lighting controller has a BEMS interface already within the controller.

As I said, we've been trying to do this for many years, but it has only been possible in the last three years: this is possible because the lighting systems have changed to align themselves a lot more with BEMS.

So are we, are we saying that the obvious benefit in the decarbonisation piece with lighting control, is about the energy saving directly from the light system efficiencies, turning lights off when they're not required? Daylight saving, all of that kind of thing. What we're saying is, because of the advancements on the control side of it, we're now able to utilise the lighting control system to add to the decarbonisation piece by linking back to the use of the building as well, the people-movement through it, the requirements for heating, ventilation, AC etc. So we can bring that control element to bring a decarbonisation effect not only on the lighting but across the wider building.

Using the same data points that are available from the Lighting Control Proximity, infrared sensor. We can control the HVAC; turn the heating and ventilation on and off. We could also use exactly those same data points for a room booking system. So, for example, in an NHS-type environment, you have a lot of consultants that might leave at different times of the day, so the room isn't occupied. So you can use that sort of data. Quite an important point is the BMS can be integrated into the fire alarm now, so in real-time the Fire Brigade can come to the site and know exactly where people are. Also, in certain areas of a really large enterprise building, not all the fire alarms need to go off.

So much data that you can bring from one piece

of hardware, to know the other services within the building. This reduces hardware and labour costs. Using the same data points means less cost to the end user.

I'm hearing that there are some embodied decarbonisation benefits in there as well in terms of the commonality of components like controllers, so we're not just talking about zero point-of-use decarbonisation. We're talking about embodied carbon in terms of the manufacture of duplicated systems to some degree as well, which is a wider piece, not necessarily, I think, where we thought we were heading.

As we said before this has to do with how much technology has changed. If you take, for example, the analogy of a car 30, 40 years ago, still had four wheels and steel, but the efficiency of today's car you cannot even compare. Something similar has happened with the connected lighting. There are so many functions embedded now in these systems that can optimise the whole operation much more than a simple dimmer or scheduling system. Unfortunately, it's not something that we can apply a number to. We cannot say it's 20 or 30 or 50%, because obviously, it depends on the project, and where it's going to be used. But it gives you the option to tailor it, and if we know that, we can now make this system the best and have the maximum efficiency compared to what we used to have 20 or 30 years ago.

Until now we've been talking about numbers and specific quantities, but now that we're moving into the world of visualisations, and the whole analytics world: that changes things a lot.

I get so excited building up to the next part.

I'm excited to go back to that. You know, the whole thrust of this was around the decarbonisation piece, but I know from my own lighting background experience of some of the other benefits that are around. If we can leverage that decarbonisation of the energy-saving benefits, I think there's a deeper piece to be had here.

You know, some of these other benefits, that I'm sure we'll draw out of all of you, but I know I know you're chomping at the bit to talk about some of them, so you know, you start the piece off Niko to talk about the other benefits that we see with intelligent smart lighting control.

I can talk about it all day. So I promise, I'll select the one that can be linked, again, back to decarbonisation, but maybe a visual there. I would recommend our audience if they're not doing it already. Started thinking about these technologies we're talking about as a digital or an advanced Swiss Army knife. I say, advanced or digital, because it's a little bit of an analogue example, but still the Swiss Army knife, can do many things at the same time.

Going back to the bits we discussed, we spoke about how connected lighting can drive the decarbonisation journey at the light fixture level, and then at the end, through HVAC, within a building. To give you a simple example, connected lighting intelligence can tell whether a room is properly occupied or not. And it can drive decisions to take down to heating a notch, or take down the cooling a notch, and that's how we save even more on carbon emissions.

Imagine that there's enough intelligence in these technologies we're talking about, that they're adjacent to light fixtures that can tell at a high level, how humans occupy your space and whether they use it effectively and efficiently. To give you an example, if I show up selfishly, one day in the boardroom, and I isolate myself there. Any type of intelligence in the past could indicate that the meeting room is occupied all day. So will need more space, more space, more space. But the reality is that only 10% of the space has been used because Niko selfishly decided to lock himself in the boardroom. Why is this relevant, and how can connected lighting and the beauty of using data help us there?

We spoke a lot, and we know some statistics that exist out there. The buildings generate almost 40% of annual global carbon emissions. Now 11% of that comes from materials and construction. Sorry, in a very provocative statement, I will make, the more sustainable buildings in a sense are the ones that already exist. Let us go back. Plenty of cases, we know, where there is a desire to expand more and build new buildings. And I was looking at some statistics the other day, and there, I was shocked to read that, to accommodate the largest wave of building in human history, we anticipate between 2020 and 2060 to add 240 billion m2 of New build, so as human beings, we plan to be building the equivalent of an entire New York City every month for the next 40 years.

So whilst on the one hand will try to drive decarbonisation of existing buildings, we are bleeding on the other hand by putting together even more. What if one of the things, this amazing technology we're talking about could do, would be to share data back with us in different forms, visualisations, et cetera, telling us you are using your

existing buildings so inefficiently that you can afford to cut down two floors, rent them out, sell them, use them much better, and you do not need to build more. Imagine what a great impact that could have on the decarbonisation journey.

There are many more examples and case studies that transcend from security to all kinds of things, but I'm going to leave them for another day because I don't want to monopolise space, but you can tell how excited I am with this.

I can. We all interact with lighting on a daily basis, and I think for those that are not intrinsically involved in it can just be part of your mundane day and it's really good to see that excitement and that, hopefully, will stimulate that market behind it.

Simon, I think you had some particular things that you wanted to talk about, around using it to predict failure and that kind of thing within the building as a sort of additional benefit to having a smart control system.

I'm going to quote, a statement from the World Green Building Council, that does a lot about the best way to net zero carbon. The point that they were trying to make was the best way to optimise the reduction of carbon in buildings, and get to net zero carbon is actually to sweat the use of the asset. A bit like what Niko said about the existing asset is the buildings that are already there.

Periodically, there comes a time when lighting is seen to be something that needs changing, so you take out all the fittings and dump them in a skip before being taken off to a landfill. And, quite frankly, nowadays, that's just not acceptable. There, must be a better way to do things, and the only way to sweat the asset, in this case, the luminaire, and get the most 'juice' out of it is to understand what's going on inside it. LED drivers today have the ability to share data and understand the performance of what's going on inside that Luminaire. One of the biggest things is the internal temperature within the driver itself, which quite often, the environment, that the driver is in, can vary from one building to another, due to the way that it was installed. The internal temperature within that driver can have such a massive impact that it would need, replacing, and if it's installed incorrectly, it could be, you could reduce the life of that driver by about 50-60% and need replacing.

Now the important thing here is that with all that data we can start to do some predictive failure in lighting that we've never been able to do before. I know you guys in the BEMS world have been doing predictive failure for some time, to the point that you could understand how an air handling unit is operating, just by looking at one control loop of a valve. Well, you can do that with luminaire now, and the data that you can get out, that diagnostic data that you can get from a driver, you can start to look at and predict the failure of a driver

You can look at the decarbonisation around reducing the number of visits that FM companies make to luminaires, By reducing it to one visit, and then by only replacing one part of the luminaire, before it fails, thus extending the life of the asset

That's a really interesting thought. In a previous employ, part of what I was doing was exactly that reducing FM maintenance visits to sites. Thinking about that from a wider piece, how many times do people visit a site to change light fittings, etcetera? Really interesting.

Nicos, you mentioned previously and I think maybe you've got some thoughts on making people more efficient

This is quite a big subject, so I'll just touch on the basics here. Perhaps we can discuss it in another session. We now have the means to have the system adjust the lighting to match the needs of the specific application. For example, we can have different lighting, even in an office, during the day, or the late hours, or we can have different lighting that adjusts to each individual user. There are technologies that can do that. They can detect who is where and automatically bring the right amount of lighting and the right type of lighting.

Now, I said before, this is not something we can directly measure, because we're not using numbers in this case. We can see the results with people. For example, I was reading a few studies a while ago, that pupils, in schools with human-centric lighting perform 10 to 20% better, and were accumulating knowledge faster and learning faster than with the old lighting system. So that are many ways to affect performance, and this has direct results towards decarbonisation. The more efficient we are, the less energy we consume at the end. In essence, that's what it is, the new systems, so much as I can affect and help us in our lives in ways that might not be directly measurable.

So just really around trying to use the least amount of hardware, where we can, giving the most amount of data across the board, where multiple solutions can really pick up.

I think all of the other benefits, too, are the decarbonisation piece anyway because if we are operating more efficiently as people, or as the general building, then there are decarbonisation and energy-saving features in that. And I think some of the more specific things that I've seen over time to make buildings more refreshing, such as asset tracking, for instance, in a health care environment, where are beds, where are wheelchairs, where all the surgeons if we're waiting to open an operating theatre. All of these things do make us more efficient and do lend themselves to the decarbonisation piece, the quicker and more efficiently we can carry out tasks, the less energy we're putting into them. So, I think it's something in the round.

I'd like now to look at some of the available technologies that are around and talk about some of the options that they have in terms of lighting control systems. We've got wired, now also wireless systems. Simon has touched on DALI, we've got Bluetooth and various terminologies that are used. As an overriding piece, I think there is a solution for reverie eventuality. Where do you want to start?

I'll keep it to a high level. I will say that as you said, there is wired, wireless. When it comes to wireless, There are different options, and I'm talking about Bluetooth, and LoRaWAN – we can keep drilling down.

The comment it's more important to make is the following; actual recipe points.

- Technology and technology
- Planning ahead
- Change management, Technology

Technology is not an issue. Technology was never the issue. We've got plenty of options today, and we'll have even more tomorrow. There's a gentleman called Ray Kurzweil, who came up with the Law of Accelerating Returns, and he did the maths, and he summarised the maths of what's going to happen in the future, as follows. He said in the next 100 years we will experience the same technological progress that humanity experienced from the age of agriculture to the age of the internet. Twice, Take all the technological progress in human history, double it, This is what we expect to see in the next 100 years; It's mind-blowing. We'll have plenty of options and we're going to have even more. That brings me to the next point.

We need to think, as much as possible in advance, what are the requirements and how many things, how many use cases, we will need to address at the same time. How many of all the great things we discussed earlier do we need to cover at the same time? That will dictate whether one approach versus another is preferred, whether wired versus wireless, whether we need this type of encryption, versus another type of encryption. That's going to dictate one way or another, the technology.

And the third bit, from experience, I see it's quite forgotten, is what I would describe as change management. It's not that people wake up every morning saying, Great, we've got all these fantastic things, Let's bring in some data today.

Usually, quite unfortunately some types of projects like these ones are thrown at people who already have a day job. Then, they try on top to deliver, to address, and that's where things might fall apart. So, a good practice is to consider this tag of engagement as a project that requires proper change management, so that people can embrace it so that the full functionality can be covered so that the project eventually delivers all the promises, rather than being the patchwork.

So, these are three things I felt, and, again, I've seen from the experience of being forgotten now, I'll pass it on to my colleagues for anything else there.

I don't think anything has really changed. If you really, truly understand, what are the outcomes that you're trying to achieve, or what the client's trying to achieve. If you understand what type of applications the client is trying to achieve from energy efficiency or decarbonisation, from that you would apply the best technology, whether it be wired or wireless.

I think the wireless gives you a great deal, more flexibility, and options when you want to make changes. And we've talked about change management there. I think wireless control, whether it be Bluetooth, whether it be, Zigbee, I think, gives greater opportunity now for flexibility in the future. But there is always something new lurking around the corner. And at the moment some of the big corporates, like Amazon, Google, Samsung, people like that, have put in a lot of investment into the biggest open protocol there is, called Matter.

Matter as a protocol it's being driven by those big companies built on a thread network.

And that is for applications where someone wants to interoperate lighting, in this case, with anything from AV equipment, to HVAC, to personal equipment, that's come out of, That has come out of the smart building, smart homes environment and now taken it into the commercial environment and it will be interesting to see how, that moves forward, and, some of the traditional technologies, it's going to butt up against it like DALI, like BACnet, like the traditional protocols that we've been born on. I think that'll be an interesting space to watch.

But, I definitely think that wireless, wherever

technologies use, I think gives us a greater ability to leverage that mesh in the future then, than traditional wired technologies do.

I think we've established quite eloquently that there is a real decarbonisation benefit from smart lighting control. I think we've established that other benefits are coming behind that add to the decarbonisation piece. Some really good available technologies can suit existing buildings, new builds, and various applications, depending on where you are.

So I think maybe what we need to touch on what are the first steps for people that want to take advantage of decarbonisation and other benefits around smart lighting control. What needs to be considered in those first steps? And what are those challenges?

I think for me, I would suggest maybe you need to measure where you are and what you've currently got, what type of building are you in? What's your current energy demand, what's your current energy usage? What are you actually using that building for?

The most obvious challenge that I have seen within these spaces is that many times, the actual end users do not really understand or have been informed on how to use the system and what they can do. I'll just give a brief example.

At one of the biggest museums in the UK, there was this huge warehouse where they installed, a state-of-the-art connected lighting system. Everything was automated, all the bells and whistles, and a few months down the line, the facility managers were calling us and saying that the system we were sold is barely saving anything, barely 5%. And it was interesting because whatever it has been used before, everything was fine. Plugging into the system we found out that it was pretty much running on overrides 95% of the time and that all the lights were on 95% of the time. Whatever some of the occupants were walking around, they found the override switches and they would just flip them on, and left them there. No one bothered to trace them up again. So, yes, the system could do more, could save more. But if the actual users, the occupants, override it, you cannot achieve the target.

So we need to make sure that when we design something, it is properly communicated to the end user not just using the right technology, but giving the right information and training the right people and making them aware of what they can do.

I opened up this first steps and challenges piece by talking about measuring where you are and understanding what you've got. But in our lead-up conversation to this, Niko, you had a point earlier in the process than that.

I believe in the power of the basics, and one of the basics is, if you don't know where you're going, you'll find yourself somewhere else. So since Nicos led to the story, let me share my experience. It's a real story. It happened a few years ago in the headquarters of a global company that shall remain unnamed, somewhere in continental Europe. So we're talking about the decarbonisation journey of this multinational company. We're in the meeting room and in the same meeting room are the head of sustainability and the CFO. At some point in time, I got confused.

I felt I was hearing conflicting messages, so I asked, point blank, the following question.

"If you do not achieve, your decarbonisation goals by that date you indicate as a drop-dead date, will heads roll?"

And in a very unplanned and embarrassing way at the same time. The CFO and the head of sustainability jumped and they both spoke. The answers that they gave at the same time were...

- One said definitely not
- The other said absolutely, yes.

...It was embarrassing, so it brings me back to the basics. It's not just having a goal.

You, corporations, and teams need to be honest with yourself and answer the question...

"What are the consequences if the targets are not met within the specified time frame?"

Because the answer to this question will dictate the technology to be used, will dictate the risk to be taken, and will dictate the resources that would be put in place, whether it's time or money. Quite a few times, this is forgotten.

I think to carry on from that theme Simon, I think we were talking earlier a little bit about the process involved in that, so if you don't know what that journey is, Maybe you want to expand on that. You know, what should we do if you don't understand the journey? Where can you go? Where can you get that information needs the process you can follow.

I think the simplest process that people can follow is the RIBA model, for example, that will yield stage 2, and stage 3 design will go out to tender. We try to educate a lot of consultants now about always looking with the end in mind, which I think is what Niko was referring to there, and knowing where you want to go to. Stage 7 is

how do you want to operate this building. Even if you can just describe the way the building should be operated, it indicates technology companies, like all the people on this call the ability to make some good decisions in stages 2 and 3 when you design the job in the first place. Because if you don't design it in there are some things and now refer to Enlighted. If you don't put the right things in the Luminaire, you will not be able to get them out, in this stage seven. I think the industry fails sometimes, by not clearly understanding, how do you want to operate this building, and I think, maybe more now, because of this availability of data, those questions are actually more relevant than ever.

Involve companies like us at the early stages, We're here to help, you know, we can assist with the design specification, and we can ensure that the solution matches what the client wants.

Another thing is obviously not to allow the project to be potentially value engineered. You've got to make sure that you put the right information at the start of the specification to ensure that can't be written out.

To ensure that everybody involved is a clear understanding of what the requirements are. I mean, that sounds very basic, but in a lot of cases, the client doesn't know what they want, and they need our advice and all it takes to ensure they've got a solution there, which is compatible workable, and does what it is that they want.

Just pick companies that are happy to speak with other manufacturers and work with other manufacturers to ensure that the system is, firstly, fit for purpose, and is compliant.

We started off this webinar discussing the decarbonisation possibilities from smart lighting control. I think we've expanded that out from purely the decarbonisation, energy efficiency is associated with the actual control of the lighting, through control of the building systems, then the efficiencies of the people and the processes going on in those buildings being intrinsic in that control system. It's a relatively straightforward place to start because every building has some form of lighting in it.

And then I think the natural progression there needs to look at the technologies that are available in about a huge, wide range of technologies available.

Three really good examples of which are, you know, present on this panel. You know, we've got some great product and system expertise on the panel.

And I think for me to sum up, would be that it is a big energy user. It's a big and relatively simple place to start on the decarbonisation journey, and it can enhance your building as well as help with your decarbonisation process.

So, you know, I'd just like to thank everybody on the panel for a well-informed discussion and some really interesting thoughts and input behind that. Hopefully, we've stimulated some thought within the audience, and from there, we'll lead some genuine innovation and some genuine decarbonisation moves that essentially we've all got to do in this carbon and energy-restricted world.

Thank you.

Questions

As we ran out of time on the webinar, we raised those questions which were asked via the platform with our panellists. The questions and their answers are given below

How did we arrive at these figures (figure 1)

These were developed, by panellist James, using data based on the estimation method in the Standard EN 15193-1 (Energy performance of buildings – Energy requirements for Lighting).

We have a Zumtobel system which I believe is a fully addressable system. We are just completing a BMS upgrade to Desigo CC. Will it be possible to make the BMS to read the Zumtobel lighting units both EM and Normal Fittings?

Zumtobel has a quite diverse range of control products, so we need more specific information about it. Regardless of that, an interfacing unit must be utilised, which can be a DALI controller, a software interface (API), a KNX DALI gateway, etc. depending on the type of system used. The BMS must support the interface output protocol. If you could provide some more information we may be able to help you find the right solution.

How does lighting controls take into account lighting for mixed-ability users i.e. designing for DDA...?

I believe that lighting control covers DDA regulation both by use of IR and other remote sensors and of course by simple use of appropriate switch placement as required. However, touch free switching has been recognised by DDA regulation for many years and not just in lighting control.

One of the advantages with a modern connected lighting system is that it can be adjusted to individuals. This can be done either on demand, via

voice controls or even automatically by recognising the person in a room, depending on the solution used. The easiest way though is to have simple interfacing modules, being a simple button or an app, tailored to the individuals' needs.

What is best? Infrared sensors or microwave sensors

Very dependent on application and use requirement. Both have advantages/benefits in certain circumstances.

It largely depends on the application. In short:

IR are more reliable in detecting differences in heat footprints. They are blocked by any obstacles, even glass and they can have different detection shapes by using different types of lenses.

The microwave ones are highly sensitive and can see through thin or sparse material (such as glass, plasterboard, wood etc.) Highly susceptible to interference due to their inherent nature, but also very sensitive at detecting minor motions.

It is worth mentioning that the software inside the sensor is the most important factor. The right software can even distinguish between an animal and a person, avoiding false triggers.

PIR Sensor (Passive Infra Red)

These detect heat. They do this by measuring the ambient temperature of the room using several detection beams. When a difference in temperature is detected by one of the beams the sensor is activated, switching on the lights. When all the beams sense the same temperature again the lights will switch off.

PIR sensors are typically combined with a lux-level sensor and therefore used for dimming rather than just an on/off control setup.

HF Sensor (High Frequency)

These sensors emit high frequency signals and measure the time taken for the signal to be reflected back to the sensor; this is known as the echo time. The echo time is used to calculate the distances from all of the stationary objects in the detection zone, to establish a baseline to work from. A person moving into the detection zone causes a disruption, changing the echo time and triggering the lights.

HF sensors can be placed behind plastic, whereas PIR needs to be visible. They are often used in large areas such as warehouses.

North America is still predominately a 1-10V market whereas Europe has been a digital market for a while now. 2 questions, any thoughts on how to get the North American market to speed up the adoption of DALI2 and, second, lacking the wide adoption of DALI2, how can North America best decarbonise with analogue (1-10V) systems?

One possible way would be to push for open protocol implementations and the advanced analytics a modern DALI2 or D4i driver can deliver. Both are industry standards now and can prevent vendor lock-in. At the same time, they are giving the customer freedom to replace devices in the future with the ones that match future needs, help the circular economy via open standard interoperability and reduce the carbon footprint by enabling maintenance without replacing whole luminaires.

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