

CASE STUDY

VAN GOGH MUSEUM CONSERVES ENERGY – AND ART!

ABOUT THE VAN GOGH MUSEUM

Serving over 1.5 million visitors per year, the Van Gogh Museum in Amsterdam is host to 200 paintings, 400 drawings and 700 letters by Vincent van Gogh, the largest such collection in the world, as well as traveling exhibitions of other artists and collections. Van Gogh's Sunflowers, The Potato Eaters, several of his Wheatfield and Self-Portraits, and many other iconic works are on permanent display in a beautiful, multi-story building owned by the Dutch government.



In January, 2017, the Van Gogh Institute began a phased process of converting all of the lighting in both the Van Gogh Museum and the Mesdag Collection in The Hague – approximately 1300 light points – to Xicato Intelligent Modules with Bluetooth control (XIM Gen4). The work is being done entirely after hours, without disrupting normal operations, and without moving or replacing either the artwork or the existing lighting infrastructure. No new track. No wires. No holes in the wall. No dust. The results are significant savings in energy and maintenance, but their primary motivation is Conservation.

MISSION: CONSERVATION

Light degrades the dyes used in paintings and tapestries, and even affects the color and finish of wood in carved objects and furniture. Museums carefully calculate and control the amount of light exposure each artwork receives to balance the mission of public display against the need for conservation, and to minimize the frequency of restoration work. By calculating lux-hours and by knowing the spectral power distribution (SPD) of the display lighting, museums can determine how many hours, days and weeks a work can be displayed, and how brightly it can be illuminated.



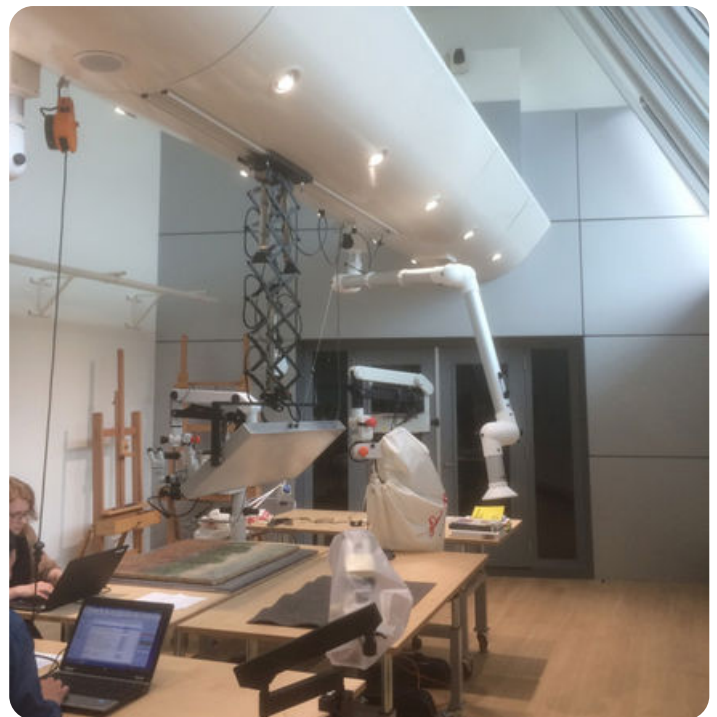
Van Gogh "Bedroom in Arles" (1888) Before light damage (simulated)



Van Gogh "Bedroom in Arles" (1888) As seen in 2015 (after light damage)

As has traditionally been the case in most museums, artwork in the Van Gogh was illuminated by halogen incandescent mounted to kilometers of track lighting. House lights were PLL compact fluorescent.

Also like many museums, the Van Gogh is often open after hours for special events, the rental income contributing to the general funds of operating the museum. Unfortunately, after-hours events increase the light exposure of artworks, contributing to degradation, especially when lighting is controlled by simple on/off switches. The Van Gogh found that their paintings were degrading faster than expected – or desired.



Van Gogh Conservation and Restoration Studio

CHOOSING XICATO

The move to Xicato began in Sep 2012, when Domenico Casillo, who manages the museum lighting, saw a presentation at instituut Lichtontwerpen (iLo – the Institute for Lighting Design, founded by Henk van der Geest) in Amsterdam, where Xicato demonstrated its Artist Series lighting. The Artist Series generates light that not only matches the color rendering quality of halogen lighting, but – even among LED solutions – is also less damaging because it radiates less energy in the harmful, high-energy blue-violet and UV spectrum.



After that, Domenico was determined that the museum would someday move to LEDs and Xicato. Domenico's interest grew when he saw another event at iLo in Nov 2015, where Xicato demonstrated early prototypes of the new XIM Gen4 with wireless Bluetooth control. This led to further meetings at Light+Building and an event in June 2016 at the Van Gogh Museum, where Xicato demonstrated the XIM Gen4 beta hardware with integrated Bluetooth beacons and individualized control, commissioned using Xicato Control Panel software, to a large group of museum curators. Kees van den Meiracker, Head of Collections, was at the event, and was convinced that XIM Gen4, especially in combination with occupancy and ambient light sensors, could provide uncompromised light quality and visitor experience, while absolutely minimizing light exposure.

So the museum formed a simple, cautious plan.

Phase One: **Keep it Simple**

To minimize disruption, and frankly because the museum was hesitant to commit to a new technology phase one of the installation involved simply replacing the existing halogen track lighting with Mike Stoane Lighting TTX2.70 fixtures with Xicato XIM 9mm Artist Series intelligent LED modules (XIM09953013A6A). These modules are capable of both 0-10V control and Bluetooth control. After museum operating hours, two employees mounted the new units to the existing track – one on the ladder, aiming the light and setting the light level with a standard 0-10V potentiometer, the other on the ground with a light meter to check the setting. The crew installed approximately

100 units each evening. In the initial phase, lights are controlled using EnOcean energy harvesting BLE switches to independently switch the art lights and house lighting zones for cleaning. Lights are turned off at night using standard on/off power switches.

Phase Two: Add Sensors

The next phase of the installation will be to add Xicato intelligent motion and lux sensors (XIS) and program the lights to respond to scheduling, occupancy and ambient light levels, to further reduce both energy and light exposure. Individual luminaire programming is done using Xicato Control Panel software, and the programmed settings – including secure network, group and scene membership, scene settings, and individualized sensor responses – are stored in each Xicato module, eliminating the need for centralized controllers or hubs. The lights themselves contain their individual schedules, listen to sensors, switches, and app commands, and make independent decisions about how to respond.



Phase Three: Central Management

Like a little computer, XIM stores configuration and status information about itself, including module type, hardware and firmware revision, its programmed maximum flux level, control interfaces (e.g. Bluetooth + 0-10V, or Bluetooth + DALI), total operating hours, on/off cycles, and histograms of its lifetime intensity and temperature states. Of course, the module also stores its network, group and scene membership, as well as its programmed settings.

Luminaire manufacturers can, at the factory, program the module with a maximum flux level (for instance, to keep it within the thermal capacity of the heat sink), as well as with their company name, the luminaire module number and serial number, and other information.

In addition, XIM periodically broadcasts information about its immediate operating status, including Device ID and name, intensity (dim percentage), current LED and PCB temperature, power supply voltage and ripple, and overall status.

Xicato Intelligent Sensors (XIS) also broadcast sensor data into the Bluetooth network. Occupancy, lux levels, temperature, and humidity can be used not only to control lighting, but to remotely monitor the room for the purposes of environmental control or – of particular interest to the Van Gogh – lux-hour tracking on individual paintings.

All of this data can be collected via Bluetooth, either locally by a PC, Mac, or mobile device, or remotely over the LAN by use of a Xicato Intelligent Gateway (XIG). The Van Gogh expects to deploy XIG in order to enable lux-hour management, to proactively monitor and manage the luminaires, and to remotely control lighting from the Reception desk.

The availability of these data create a significant opportunity for third parties to develop application software running on a server either in the museum itself or in the cloud. Xicato shares its API with any interested third party software developer, and several have begun developing to the Xicato interface.

Control Panel log screen, showing
real-time operational data



EXPERIMENTING WITH BEACONS

The XIM based luminaires, sensors, and gateway can also be programmed with Bluetooth beacons, including iBeacons, AltBeacons, and Eddystone-URL (URI) Beacons. This will allow the museum to offer location-based information and wayfinding services, allowing them to deepen the visitor experience with data that is not practical to display on the wall, including audio and video content. This information can be tied to web and social media, and presented on mobile devices that visitors already have in their pockets.



RESULTS

So far, the Van Gogh Institute loves the lighting quality and energy savings at the Van Gogh and Mesdag museums, and is delighted at how quickly and inexpensively they have been able to deploy controlled lighting. Urban Larsson, A Swedish artist whose work is being exhibited at the Mesdag, was astounded by the light quality, and confesses, "I have never before seen my paintings looking so good!" The museum Director is extremely pleased with the energy savings, and is looking forward eagerly to realizing even more savings once the sensors are installed.

"I have never before seen my paintings looking so good!"

URBAN LARSSON, ARTIST



VAN GOGH MUSEUM EQUIPMENT

Mike Stoane Lighting Luminaires

- TTX2.70

Xicato LED Lighting Modules

- XIM Gen4 Artist Series (XIM09953013A6A): LES 9mm, 3000K, 1300LM, BLE+1-10V

Xicato Intelligent Sensors (XIS)

- XIS-0101: PIR motion, lux, temperature, humidity, accelerometer

Xicato Intelligent Gateways (XIG)

- XIG-0101 Xicato Intelligent Gateway



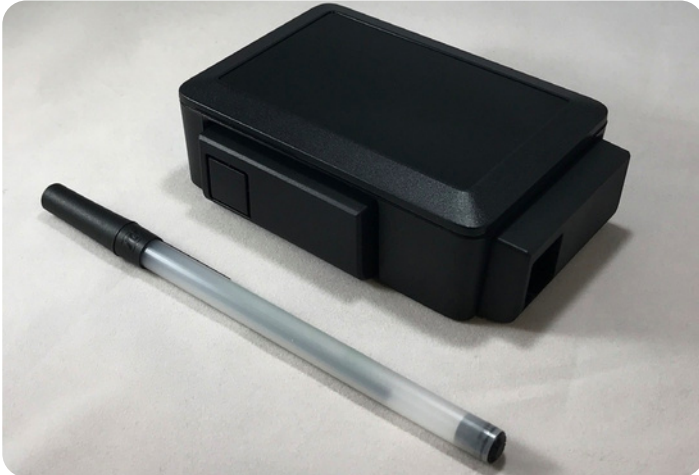
XIM is available in 19mm and 9mm LES, in multiple spectral/CRI formulas and CCTs, and lumen output from 700LM to 3000LM

EnOcean Switches (2.4GHz for BLE)

- EWSSB and EXDSB Easyfit single and double rocker wall switches for BLE

Software

- Xicato Control Panel (commissioning)



Xicato Intelligent Gateway (XIG-0101) provides range extension, remote monitoring, configuration and control access, and protocol conversion between Bluetooth and IP based protocols.



Van Gogh Museum, Amsterdam, Netherlands

Lighting Design

Frank Hulsebosch and Henk van der Geest

Photography

Jan Kees Steenman

Luminaire Manufacture

Mike Stoane Lighting, mikestoanelighting.co.uk

High Technology Lighting, hightechnologylighting.com

ABOUT XICATO

Xicato designs and develops light sources and electronics that enable architects, designers and building managers to create beautiful, smart spaces in which people love to live and work. With thousands of installations around the globe, Xicato continues to be a leading supplier of high quality lighting solutions. Xicato is defining the future of intelligent light sources by integrating electronics, software and connectivity.

Founded in 2007 and headquartered in Silicon Valley, Xicato has offices in China, Japan, Europe and the US.

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 www.xicato.com

 info@xicato.com

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