

Optical electronics or solid state lighting—Why light chips” are not LED’s

Lighting 3.0 the next stage in the (r)evolution of lighting technology

Wilcox Lighting

Background from public information

Updated Mar 2013 w/highlighting

"It is a light chip, AKA optical electronics or solid state lighting...using a type of wire usually coated in gold or precious or semi precious metals it is wound in a box or similar style applying a dc voltage the wire glows at a low [temperature](#) and at a certain color, for instance the plant chip uses 20% 440 nanometer blue and 80 % 660 nanometer red to produce a intense purple light that is broadcast directly away from the chip. It is 20 % brighter than LED and 15% cheaper (in power usage) 80% less power than HID and approx. 25% cheaper than fluorescent... LED produce 80 lumen per watt and my light produces 110 lumen per watts, the 30 watt light in white can cast light 150 ft and still allow you to show shadow puppets. This proves how effective the light is and how well it casts out at 120 degrees instead of 360 degrees such as a led or HID with out the use of a reflector" D. Wilcox

About Wilcox Electric, Inc.

Founded in 1993, Wilcox Electric, Inc. (<http://danwilcoxelectric.com/>) is a diversified, mid-sized [electrical contractor](#) based in Langley, BC, Canada that counts Chevron Canada, BC Lotto Corp., Sears Canada, Earls Restaurants and other widely-known names among its clients.

Wilcox’s horticulture lighting technology arm works with programmable light chips to develop and manufacture new, patent pending lighting solutions. Light chips are different from bulbs or LEDs – they resemble printed [circuit boards](#) that emit various coloured lights. For a given crop, spectral light output can be custom-tailored in “recipes” to optimize photosynthesis, flowering, fruiting, and other growth parameters.

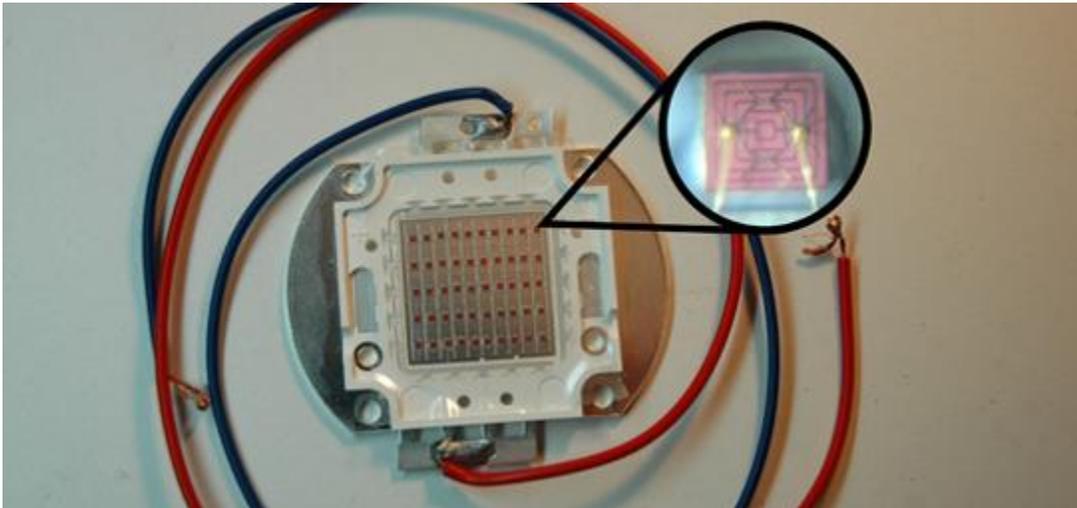
Wilcox’s light chip technology is functionally and energetically superior to the lighting systems in common use in greenhouses today. In contrast to the widely used High Intensity Discharge Lighting (HID) lamps (e.g., [High Pressure Sodium](#) (HPS) and Metal Halide (MH) lamp systems), Wilcox’s light chips:

- Consume up to 80% less electricity for an equivalent light output (100 Lumens / Watt);
- Operates at 120 degrees Fahrenheit; can be placed much closer to plants;
- Last significantly longer (average rated lifespan of 80,000 hours);
- Degrade far slower (lumen output is reduced by merely 1% per year);
- Cast light in such a way (120 degrees) that reflective and optical devices are unnecessary;
- 100% recyclable and have no environmental fees attached to their purchase or disposal.

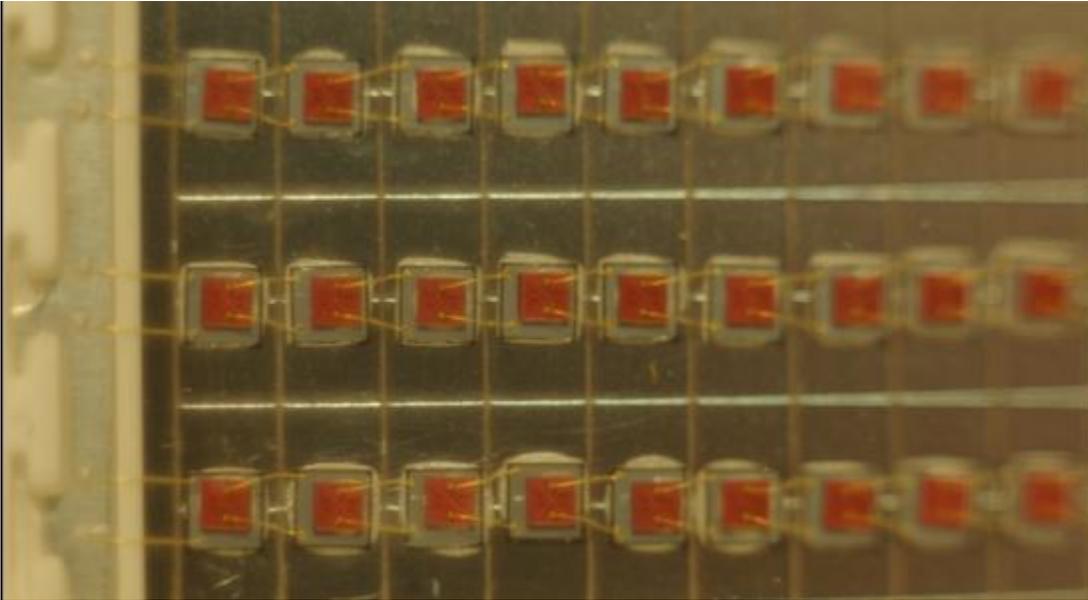
Solid State Light Chip

Our invested interest in artificial lighting technology is aimed at creating a more successful growing climate. Solid state lighting is the future of efficient, sustainable lighting solutions. The photos below represent the next stage in the (r)evolution of lighting technology. Light-Chips are not like bulbs or LED's, they are a printed [circuit boards](#) with light emitting pixels; and the benefits make it a superior product.

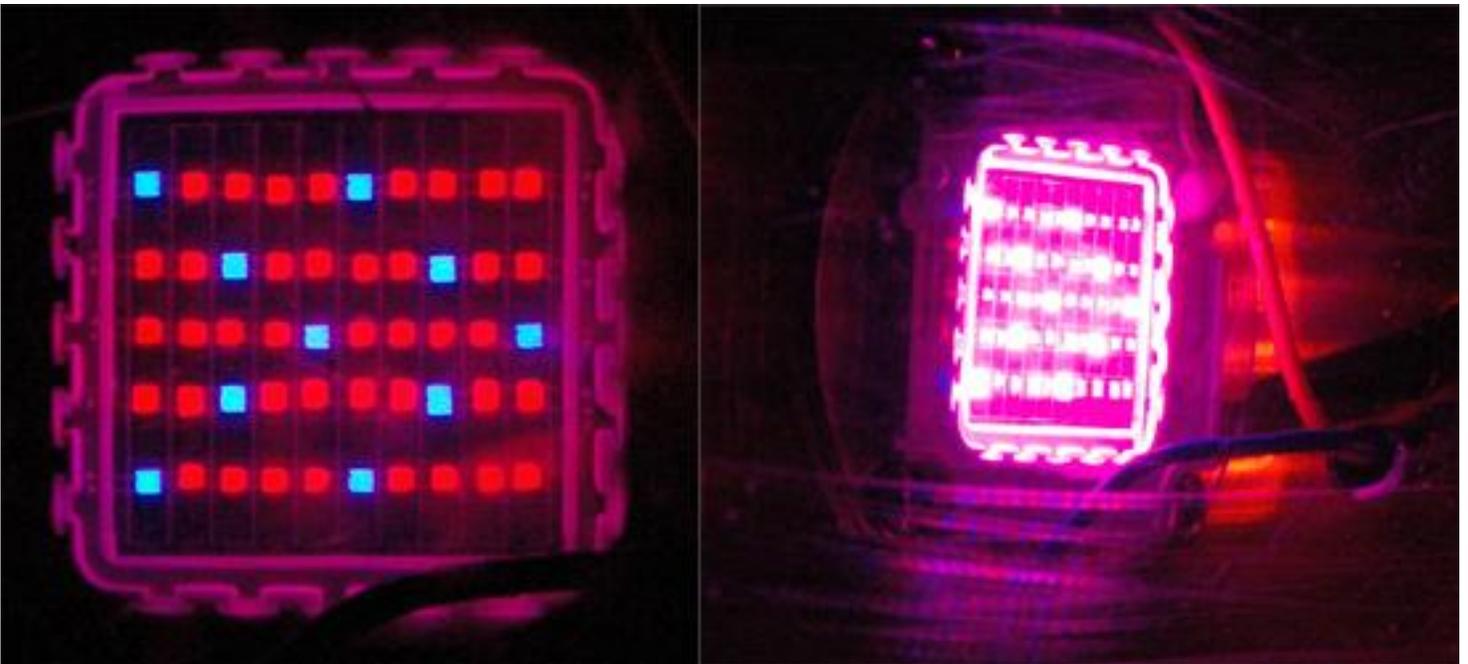
The benefits of our Light-Chip are numerous. The Light-Chip boasts an average rated life span of 80,000 hours. It creates 100-110 lumens per watt; or 50-1500 micromoles for photosynthesis; and lamp lumen depreciation value of .96. For those in the agriculture industry, the Light-Chip can be customized to meet spectrum specific criteria needed for maximum photosynthesis (ideally 660nm and 440nm, 4-1 ratio). The operating temperature is 120 [degrees](#) Fahrenheit, significantly lower than traditional HID and LED equivalencies; and is warm to the touch allowing plants within inches for maximum micromoles and without the chance of burning. With these benefits, commercial growers and indoor gardening enthusiasts alike can start to address issues in creating a successful growing climate (energy consumption, heating / cooling, maximum photosynthesis).



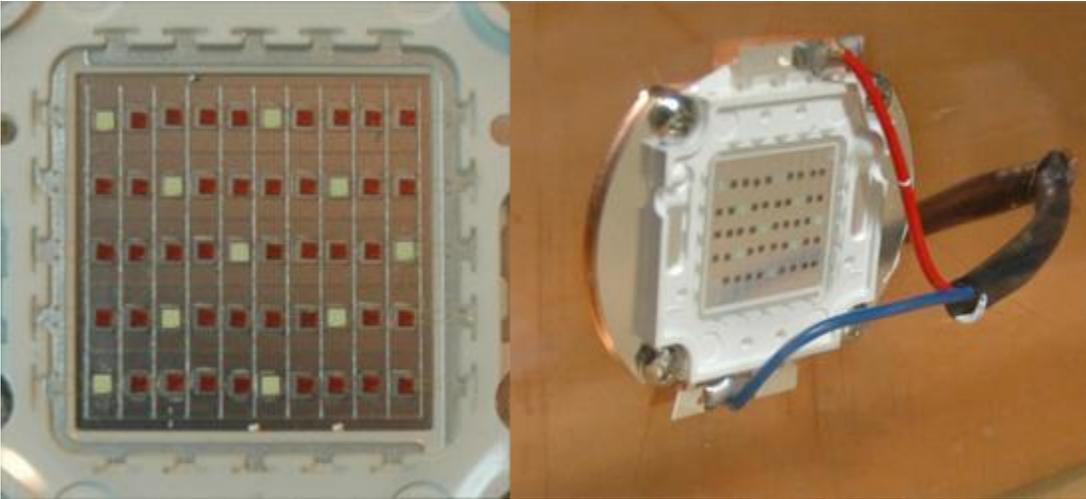
Light Chip (not LED): Wavelength spectrum specific for optimal photosynthesis



Printed Circuit Board Light Chip: 110 Lumens per Watt



Light Chip: Light emitting pixel for optimal photosynthesis (photo heavily filtered)



Printed Circuit Board Light Chip: Superior Photosynthesis [Grow Light](#)

Light Fixtures: Highbays, Flood Lights, Grow Lights, and Light bulbs

Need More Light?

First off, our lights require 75% less electricity and produce 75% less heat compared to lumen equivalencies; same brightness, less money!!! Who doesn't like saving [more money](#)?!?!?!

Our light systems are state-of-the-art lighting, for uses in residential, commercial, industrial, and yes growing; all fixtures can be retrofitted with spectrum specific light chips. Designed to be the most functional and efficient lights on the market. Fundamental to the design is the Light-Chip, a printed circuit board with light emitting pixels (not LED's!).

All of our light-chip products offer a number of significant benefits to the (r)evolution of lighting systems. Light Chips converts electricity more efficiently to light; consuming at least 75% less electricity than traditional equivalencies while emitting the same number lumens (or micro-moles). This also means the Light-Chip's primary function is to make light (not heat), operating at 120 F (49 C) the Light-Chip is warm-to-the-touch, not hot our burning or dangerous. The life span of a Light-Chip is 80,000 hours and has a lamp light depreciation value of .95. Light-chips contain only trace amounts of carcinogens and at the end of their life are 100% recyclable.

Light Chip most beneficial points:

- Consume 75% less energy and money
- 100-110 lumens / watt
- Operates at 120 F (compared to 400-550 F)
- Lamp light depreciation value of .95, or approximately 1% / year
- Life-span of 80,000 hours
- [Grow Light](#) only: Spectrum specific optimal photosynthesis, 660nm-red / 440nm-blue @ 4-1 ratio

For detailed information on specific models visit our [product page](#).

Synopsis of Lighting for Greenhouses and Agricultural Technology

HIGH INTENSITY DISCHARGE LIGHTING (HID), [HIGH PRESSURE SODIUM](#) (HPS), METAL HALIDE (MH):

HID technology has been a long time standard in the agricultural industry. A significant number of greenhouses now incorporate artificial lighting within their growing facilities (600W or 1000W HID; ballast and bulb systems). This lighting system, while a common standard, poses a number of unnecessary concerns to growers and their operations.

An [HID bulb](#) / ballast system have incredibly high energy or power requirements. Commercial HID systems average 7.5amps – 10amps @ 120 volts, which equates to 50 – 60 lumens per watt. In HID systems, 50 percent of the energy conversion results in heat, which is emitted from both ballast and bulb; although the majority emits from HID bulbs at over 450 degrees Fahrenheit. The use of energy is less than ideal when the primary function is meant to be light production and results in unnecessary consequences.

The extreme heat emitted by [HID bulbs](#) has a number of consequential inefficiencies. One, extreme heat, created by HID bulbs inhibits the plant's necessary process of water evaporation and aspiration; and in extreme cases where HID bulbs are not kept at a safe distance from plant growth (16" – 30"), burning occurs. Two, HID bulbs are prone to explosions when sprayed with water or liquids, showering the plants with glass and carcinogens which in turn call for replacement of the effected plants. Three, excessive heat will no doubt require air conditioning to keep ambient temperatures at an optimal environment for plant production. This combination is beyond inefficiencies, most are dire consequences; and heat is not the only issue of concern.

HID ballasts are typically use one of two types of bulbs, High Pressure Sodium (HPS) or Metal Halide (MH), adding additional concerns to this system. Due to the extreme power / heat combination, HPS and MH bulbs require changing every six months to maintain a maximum 'lumen per watt' output. HPS and MH bulbs also contain known carcinogens (mercury and other heavy metals) that must be recycled through government designated recycling depots at an additional cost (environmental levies) to the grower; both at purchase and again at disposal. Traditionally, all bulbs cast light at almost 360 [degrees](#). While growers adapted by using reflective devices to redirect the light from the bulb back down, if we call to action the inverse square law for light, this is yet another inefficiency. Finally, HPS and MH bulbs emit the entire spectrum of light, where only a small, specific, portion is needed for photosynthesis.

The existing technology currently used in the commercial agricultural industry is simply inefficient in its ability to create a successful growing climate; never mind ideal photosynthesis. The characteristics of HID bulb – ballast systems and HPS / MH bulbs and the consequences that succeed them are simply not suited for agricultural uses.

LIGHT CHIPS or OPTICAL ELECTRONICS (OE):

Light – Chips or Optical Electronics are the next stage in all types lighting technology; and the answer to all of the agricultural concerns posed above. Research and development in lighting and [lighting fixtures](#) is a constant

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race for functionality and efficiency; and for the agricultural industry, optimal photosynthesis. The Light – Chip is the answer.

The benefits of the Light – Chip are numerous. First, it requires only 1.3 amps of power at 120 volts. This energy consumption results in 110 lumens per watt or upwards of 1500 micromoles. When compared to HID systems, this is 80 percent decrease in energy consumption. The operating temperature is 110 – 120 degrees Fahrenheit, a 75 percent decrease in heat production. The heat output of our Light – Chip's is low enough that fixtures can be located within 1" to 3" of the plant canopy; and touching is not a concern to the health of the plant. In addition, the low heat production should result in a significant reduction in water usage (from evaporation) and air conditioning (excessive heat). The energy that Light – Chips do use is seriously, and calculable, efficient.

The benefits do not stop there. Light – Chips cast light in 120 degrees and do not require reflective devices. A significant advantage over HID systems and bulbs (even LED's) is that the energy usage is directed only to the desired surface (unless you need light in 360 degrees). In addition, Light – Chips are designed to be programmable to a specific spectrum. Each pixel mounted on the printed circuit board is capable of emitting its own specific color from the specific, measured in nano meters (nm). For the agricultural industry the commonly agreed spectrum for optimal photosynthesis is 660 nm (red) and 440 nm (blue) at a 4-to-1 ratio, with trace amounts of orange; however, different species may require a slightly different spectrum.

Light – Chips are not bulbs and they are not LED's; not LED's! Upon first inspection a Light – Chip appears to be a printed circuit board, approximately the size of a postage stamp, with a designated number of pixels. The light emitting pixels are where the Light – Chip gets its ability to program a specific spectrum. While excessive heat is not a concern a small, metal (copper or aluminum) heat sync is adhered to the rear of the fixture. In addition, a constant DC driver located within the housing, and will maintain light output at any voltage between 80 and 300 volts without rewiring.

The average rated lifespan for a Light – Chip is 80,000 hours; with a lamp lumen depreciation value of 0.95. Simply put, Light – Chip fixtures will last a long time and will emit with much the same efficiency as when they started (See [Operating Costs](#) for detailed cost savings). Light – Chips (and fixtures) are manufactured with relatively little amounts of metal and only trace amounts of carcinogens. And at the end of their life are 100 percent recyclable; and carry no additional environmental feeds to purchase or dispose.

Light-Chip vs Other Bulb Types

Comparison Chart

	Lumens / Watt	Rated Avg. Life (hours)	Lamp Light Depreciation (LLD)	Colour Rendition Index (CRI)*
Light-Chip:	100-110	80,000	0.95	99-100
LED:				
Cool White LED's	60-92	25-50,000	0.80-0.90	70-90
Warm White LED's	27-54	25-50,000	0.80-0.90	70-90
High-Intensity Discharge:				
Mercury Vapor	25-60	16-24,000	0.75	50
Metal Halide	70-115	5-20,000	0.65	70
High-Pressure Sodium	50-140	16-24,000	0.84	25
Fluorescent:				
Standard tube	30-110	7-24,000	0.85	50-90
Compact Fluorescent lamp	50-70	10,000	0.95	65-88
Incandescent:				
Standard "A" Bulb	10-17	750-2500	0.90	98-100
Energy-Saving	12-22	1-4,000	0.92	98-100
Halogen	25	3,000	0.95	98-100