

PRESS INFORMATION - FEBRUARY 2015

Aluwave AB – designs and supplies LED modules and systems to the lighting industry and to innovative customers with unique light requirements

Aluwave is a rapidly growing provider of customized LED modules and lighting systems. Our offering includes everything from the necessary components, such as LED modules, drivers, optics, control systems and thermal management, to fixtures and lighting systems.

We offer short time to market, and experience gained from a range of demanding market segments including indoor, street, technical and vehicle lighting. Our solutions are based on the latest products and technologies, and our extensive thermal management know-how.

Aluwave has Swedish owners, both private and institutional, and eighteen employees. Our facility, including head office and production, is based in Gothenburg, Sweden.



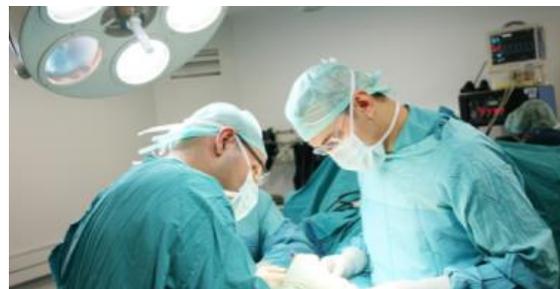
Indoor lighting



Street lighting



Vehicle lighting



Technical lighting

History

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| 2005 | Aluwave AB is founded within the Chalmers University business incubator program, focusing on electronics cooling material science. The work results in a material of our own, Alunat™, a direct ceramic-on-heat-sink solution. |
| 2006 | Aluwave is awarded the first Alunat-based contract for an LED application. Alunat is commercialized to a ceramic-based metal core printed circuit board. We notify an increasing demand for LED modules. Aluwave is appointed as a Certified Solution Partner, as the first Swedish company, in the Future Electronics Lighting Solutions network. |
| 2007 | Several customers in the general, automotive and outdoor lighting industries select Aluwave as a provider of complete LED modules and design services. |
| 2008 | Aluwave provides customized LED modules with configurable functions and parameters. Customers are mainly lighting industry manufacturers demanding short development cycles and a unique design based on proven technology. |
| 2009 | Several new LED projects are secured including street lighting, medical applications and touch screens. Aluwave participates in a research project of optimized lighting for forestry vehicles, and starts to use infrared and ultraviolet LEDs in different applications. |
| 2010 | Aluwave presents an LED module family concept. This concept enables large producers to purchase modules with varying form factors but providing a common solution for LED, driver, optics, sensors and control systems. Aluwave is elected as a Premium Lighting Partner by EBV Elektronik. |
| 2011 | Focus is now on customers in our four market segments; General, Street, Technical and Vehicle lighting. We now invest in a new, larger facility and a production line of our own. Aluwave is appointed as member of the Swedish lighting association, Belysningsbranschen. |
| 2012 | The number of customer projects increase, now also into the retail segment. Our business now includes everything from customized LED-modules to design and production of complete fixtures. A supply chain for the purchase of casting, glass and accessories is established in Asia. Aluwave is appointed as a partner in “LED-light-for-you”, a global industry network initiated by Osram. |

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| 2013 | This year, sales increased by 100% which results in expansion activities internally; an increased facility area, several recruitments and a doubled capacity of the surface mounting by implementing an additional production line. |
| 2014 | Investments are made to ensure quality, logistics and traceability of product versions. Once again, we expand our facility, now in the purpose of installing a high-bay storage and making room for more staff. A new Aluwave company, including a production site, is established in China. This to be able to supply LED solutions locally to our customers' assembly plants and to develop our supply chain in the region. |

Aluwave's four market segments

Indoor lighting

In indoor lighting applications, properties like glare, color rendering and energy efficiency are extremely important. One typical application is retail lighting which requires high color rendering for efficient exposure of merchandise.

Dimming, smart energy-saving functions, presence detection and control system integration are frequently requested functions in this segment. The products, such as task lights, pendants, downlights and spotlights, are normally produced in high volumes and are in a price sensitive segment. Main benefits of LED in this segment include small form factor, high energy efficiency and selectable color temperature.

Street lighting

Today, mainly LED based street lighting is installed and there are many different fixtures and control systems on the market. The high energy efficiency of the LED light source is the main reason for replacing traditional light sources by LED systems in this segment.

Technical lighting

For some applications, there are very specific requirements on the performance, quality and function of the light source. It may be a specific wavelength of the light, a minimum energy or intensity level, certain regulatory requirements, or extreme form factors for example. These requirements are typically found in medical, horticulture and underwater applications, to mention a few. Infrared and ultraviolet applications are increasing in importance as the LED availability in these wavelengths improves.

Vehicles

Whether it's an ambulance on the highway, a harvester vehicle in the forest, a drilling rig in a dark mine, or a cruise ship at sea, it needs a professional lighting solution.

LED solutions are now established in the vehicle market thanks to their ability to provide tailored lighting while consuming little power. This low power consumption makes these types of solutions particularly interesting for the electrical vehicle market including battery driven cars, motorcycles and scooters, as it directly improves the mileage of the vehicle.

We know thermal management

Technological development in the LED industry continues to advance at high speed. It is now possible to design automotive, street, work, and industrial lighting with excellent performance. Additionally, LEDs are now at a price/performance ratio which allows the technology shift to LEDs to advance on a broader scale. To keep up with the rapid LED developments and high competition on the market however, a focus on the bearer technologies is required in the design phase. This as the LED generates heat which conducts into the circuit board. If a low quality printed circuit board is used; the LED may overheat, degenerate and eventually fail. A high quality bearer will, at a higher cost, enable longer lifetime, higher light intensity and lower energy consumption.

With proven design competence and experience in electronics cooling technology, Aluwave can recommend the bearer technology and mechanical design needed for each solution, optimizing heat management and lighting performance. This is our backyard; Aluwave is based on the expertise in heat management and our own material, Alunat™. Nowadays, we cooperate with different material manufacturers and select the material with the right price/performance ratio for each individual project.



Surface mounted LED modules at Aluwave production



LED-based light source made by Aluwave



Linear LED-lighting system made by Aluwave



LED based spot-light made by Aluwave

It started with golf

It all started when one of the company's founders was out playing golf. He needed something that could help him to find lost golf balls. He discussed this with an old friend that was an expert on surface treatment and microwave technology, and came up with an answer. The idea was to use a special surface treatment on the golf balls and then to locate them with a small radar device kept in the golfer's bag. After looking into the financials it was decided however that the device would be too expensive to produce.

The surface treatment concept was too good to pass up though, so we pursued other more lucrative applications. Based on properties such as extremely good heat conductivity and electrical isolation, the electronics cooling application was identified as a particularly interesting market, and is the foundation of the company today.

Initially, a material of our own, Alunat™, was presented to the market. Potential customers turned out to be interested in LED solutions, where heat management in the printed circuit board is key. Alunat™ was then re-launched as a ceramic-based metal core printed board to meet this demand. However, quite soon it became clear that our customers preferred to purchase completely equipped LED modules instead of a material. That's when Aluwave entered the journey to become a leading provider of customized LED solutions, meeting the unique need of each and every customer. Today, our offering includes everything from LED modules to complete fixtures and lighting systems.

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