



CANZ

COMPETITIVE ADVANTAGE NEW ZEALAND

VEGA INDUSTRIES LTD.



A History

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Vega Industries Limited

1. The Company Today

1.1 Overview

Vega Industries Limited is an Optical Engineering company. It is in the business of designing and building lights and beacons for marine navigation and other visual signal lights. Combining optical and electronic technology, Vega has developed beacons that can be operated automatically and monitored electronically. Their primary application is in lighthouses and other coastal sites, including offshore buoys. Vega Industries continues to occupy a purpose-built factory site in Porirua, where the company began production in 1972. Porirua is located 20 kilometres north of Wellington, the capital city of New Zealand. The factory overlooks the Porirua Harbour, in which Vega's first products continue to operate today.

Vega Industries now has 25 employees, many of who are master instrument and metal machinists.¹ The company also employs specialist designers in the fields of optics, mechanical engineering, electronic and electrical design, and software engineering.² Staff numbers have increased relatively slowly, despite the successful growth of the company. Higher levels of productivity (and accuracy) have been achieved through a move towards computer technology, including CNC lathes and computer controlled milling machines.³ Moving away from manual production techniques was seen as vital for Vega's future.

“To keep making things manually in a third world style, but not operating in a third world country, we just wouldn't be able to do it” – Vega's Marketing Manager Martyn Cook.

John Rochfort, Vega's Managing Director, suggested in 2001 that staff numbers would never venture over 20, due to the combined effect of a number of factors:

- John's desire to keep a tight hold on growth,
- the small pool of people with appropriate skills,
- the relatively small size of Vega's chosen market niche.⁴

¹ **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

² Company website www.vega.co.nz accessed 22/04/04

³ **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

⁴ Ibid.

“There are about 19 employed. We actually haven’t got enough but we can’t expand because we can’t get the people.” – John Rochfort⁵

Because their market would not support exponential growth, Vega concentrates on creating sustainable growth that will ensure its future viability. The company continues to introduce new aids to marine navigation, aimed at increasing performance and reliability while reducing the whole-of-life cost to its customers.

Vega’s core products are its PEL sector light⁶ and the VRB-25⁷ lighthouse beacon originally manufactured for the U.S Coast Guard. Over the years Vega has invested in continual product development. Interactive monitoring systems, and a wider range of beacon and light products have complemented its two core products. More recently, Vega’s development of Light Emitting Diode (LED) beacons has created another core product line. The new generation LED beacon is much smaller than its predecessors, thus allowing Vega to develop a mass production capability. Market perceptions need to be changed, however, to make purchasers more aware of the potential benefits of the LED beacon.

“We have to meet the perceptions of the market. People don’t want to pay more than a certain amount for a buoy lantern even if it has significant economic advantages.” – Martyn Cook⁸

90% of Vega’s products are exported, with the majority being developed for the U.S, Canadian, Australian, Swedish, Danish and Russian markets.⁹ Recognising the limited potential of the domestic market, Vega began its exporting operations immediately after commencing operations in 1972.

“The fact that the company had its own technology base and that it was exporting was a bit unusual for New Zealand. A lot of the technology companies are in fact branches of overseas technology companies where you are implementing someone else’s new goodies... this was the reverse flow, which appealed to my sense of patriotism.” – Martyn Cook

Vega has been able to head off major competition from France, Germany and Holland, and offset its distance from markets by offering a superior product. This is largely attributable to the high priority given to research and development. Of Vega’s revenue, 18.9% is invested in research and

⁵ Excerpt from interview with John Rochfort, 25/01/01. All other excerpts taken from interview unless otherwise noted.

⁶ See Appendix

⁷ See Appendix

⁸ Excerpt from interview with Martyn Cook, 29/01/01. All other excerpts taken from interview unless otherwise noted

development; by comparison only 12% is spent on marketing.¹⁰ High levels of research and development allow Vega to undertake design work for other industries, at least one large system project a year¹¹, as well as fulfilling contractual obligations to provide highly specialised optical equipment to a variety of end-users.

1.2 Leadership

“The first thing that I’ve noted very keenly is that John Rochfort is competent to do pretty much anything. In other words whenever I say to John could you do this, he’s never said no... and he does it, and he does it on time and under budget and he puts a huge amount of effort into it.” – Martyn Cook

Vega Industries is dominated by the figure of John Rochfort, an optics engineer that previously honed his skills at the Department of Scientific and Industrial Research (DSIR). He joined Vega Industries in 1978, roughly five years after its formation. John became established as Vega’s managing director, researcher, production controller and marketing manager, and has been the main driver behind the company’s success. Over recent years he has relinquished the reins on marketing, employing a marketing manager, Martyn Cook. As Martyn explains, John’s ability to do everything left him no time to build overseas markets.

“John was doing pretty much everything in the company, running it all, doing the design, running the administration, looking after the finances, and it’s an odd aspect of Vega’s work that most of our markets are somewhere else, and so that really severely curtailed John’s ability to travel.”

John wishes to further divest his time from management and marketing in order to concentrate his energies on research and development. He has been pivotal in the constant development of new technologies, with all of Vega’s designs attributable to concepts developed by him.

Controlled expansion and development is the strategic style that John Rochfort has employed to build Vega into a successful international company. He has specifically avoided rapid expansion and he maintains a high level of control over all Vega’s operations. John believes that this control is imperative in an industry that demands high quality products¹², especially when their function is the

⁹ **Hutching**, G. (1995) “Light Years Ahead.” *New Zealand Business*, March: p12.

¹⁰ **Harrington**, D. (1999) “Futureproof Positive.” *New Zealand Management*, 46(2): p38-41.

¹¹ **Matla**, S. (1994) “Vega Industries shows the light to US Coastguard.” *Export News*, October 17: p10-14.

¹² **Harrington**, D. (1999) “Futureproof Positive.” *New Zealand Management*, 46(2): p38-41.

safeguarding of lives. He also sees simplicity as the key to building high quality, reliable products, and adheres to the KISS philosophy, (Keep-It- Simple-Stupid).¹³

John Rochfort has an in-depth knowledge of the industry, developed from his 20-plus year commitment to Vega Industries and making him vital to the Vega organisation¹⁴. He assists Vega Industries to safely navigate its way through what are the increasingly tumultuous waters of international trade.

“John Rochfort’s expertise has been recognised around the world a bit more, and he has been invited to sit on panels and that’s had a major bearing on marketplace performance... That whole exercise established a credibility for Vega at a company credibility level which is above the product credibility level.” – Martyn Cook

1.3 Product range

Vega’s products can be found throughout the world where the sea meets the land¹⁵. Due to the nature of their use, they must be highly precise and reliable, and they must also be able to withstand harsh environmental conditions. Vega has met these challenges, developing several world-first technologies. There are four key products: sector lights, rotating beacons, LED lights, and remote monitoring systems. This range of signalling products includes: PEL Sector Lights [PEL 3 & 6 and three baby PEL 2 lights]; the Rotating PEL Light; Rotating Beacons [VRB-25 & SPRB-12]; LED beacons [VLB-44 & 48 and self-powered VLB-34] including a linear lead light [VLL-43]; a Railway Level Crossing Signal Light [VLB-40]; a Precision Approach Path Indicator for aircraft glide path guidance; a 305mm Signalling Searchlight designed for the ANZAC frigates; the solar-powered XAB-17 Lighthouse Beacon; a remote Lighthouse Station monitoring and control system [VegaMAC]; a Buoy Monitoring System [VegaTEL]; GPS Receiver which synchronises flashing lights on buoys and determines their position; microprocessor-based Controllers [VC28 & 30 and CALC-2000 & Logic Inverter] for automated control of navigation aid stations and navigation lights¹⁶.

1.3.1 Sector Lights

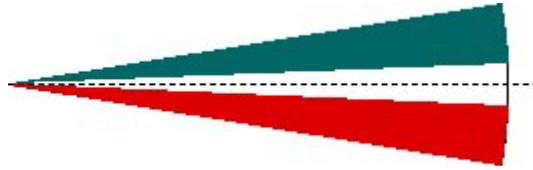
A Sector Light is a projection light which shows a different colour when viewed from different angles at sea. PEL Sector Lights are so precise that a complete colour change at a sector boundary

¹³ **Hutching**, G. (1995) “Leading Lights.” *North and South*, February: p7.

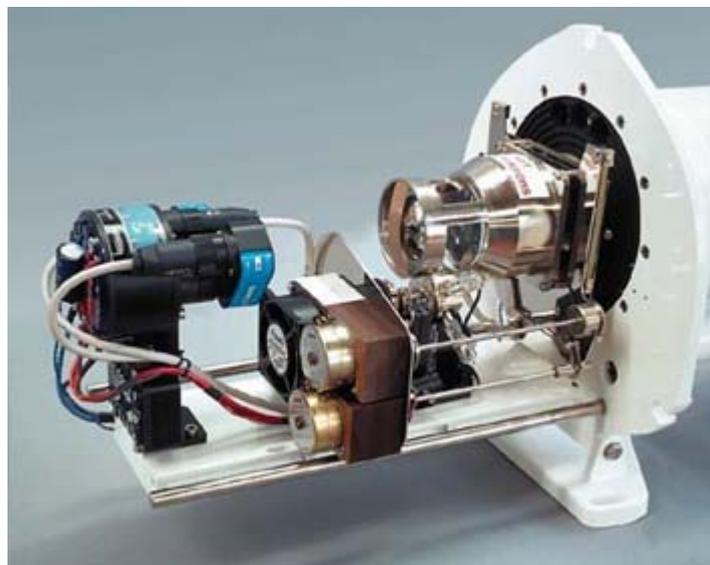
¹⁴ **Harrington**, D. (1999) “Futureproof Positive.” *New Zealand Management*, 46(2): p38-41.

¹⁵ **Anonymous**. (1992) “Vega’s a leading light.” *The Dominion (Business Outlook Supplement)*, May 29: p14.

occurs over an angle of less than 1 minute (0.02°) in most models. This corresponds to a lateral distance of just 1 metre at a viewing distance of 3.5 km. In addition the intensity is maintained right to the edge of the beam, and does not reduce the further the observer is away from the axis¹⁷.



The colour of the light provides directional information to the mariner. A single sector light design is of little use in marine applications. Unlike airports, where each approach path is similar, each marine port and harbour is unique. A flexible approach is required, and a range of subtenses and intensities is necessary to address the many restrictions of the site. When sites are remote, PEL sector lights make efficient use of solar power¹⁸. The PEL-6 Sector Light is much larger and more powerful than the PEL-3. It is designed to give a direction-indicating signal both day and night, which removes the need for a separate day-marking system. To do this it needs to be up to 350 times more intense during the day. It carries a 24 VDC 250 Watt halogen lamp and is capable of 4-5 nautical miles (Nm) daylight range. The actual useful range depends on atmospheric transmissivity and level of background lighting¹⁹.



¹⁶ Vega Navigation Lights corporate brochure

¹⁷ Vega website accessed 23 April 2004

¹⁸ Vega Navigation Lights corporate brochure

¹⁹ Vega website accessed 23 April 2004

For critical applications the earliest warning of deviation from the centre-line is required. The oscillating boundary system was invented by Vega to provide a proportional signal. The proportion of each 3-second cycle spent in each of two colours (example: red/white) indicates the relative closeness of the corresponding sector boundary. Hence, a white light which turns red for a fraction of a second every 3 seconds indicates a slight deviation from the central white sector towards the red sector. This allows the sector light to operate in situations where manoeuvring tolerances are particularly tight and where additional positional information or more frequent updates are needed. Oscillating boundary sector lights are used at the Marlborough Sounds entrance to Cook Strait, Lyttleton Harbour and Mermaid Sound²⁰. PEL Sector lights are energy efficient; give high boundary resolution colour changes; are highly accurate; have uniform beam intensity; have rugged and versatile controllers that are completely sealed, easily programmed and reliable; and, with rugged engineering, including stainless steel and gunmetal materials and chemically tough lenses, have an expected minimum life of 20 years²¹.

1.3.2 Rotating Beacons

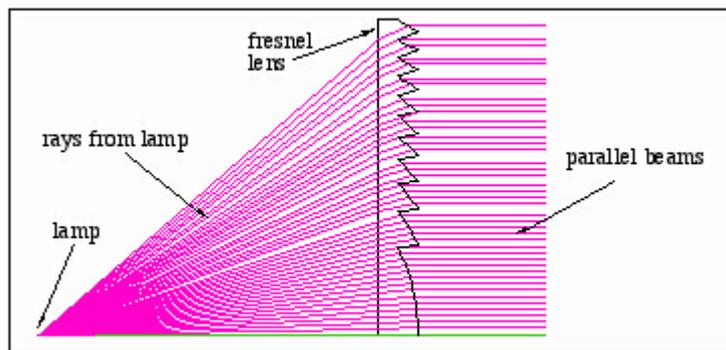
Vega's VRB-25 is a fully automatic solar-powered lighthouse beacon has a range of 15 to 22 nautical miles. It has proved a reliable and robust lantern, with more than 400 in service worldwide, mostly in North America. The VRB-25 works on the principle of a stationary lamp in the centre, and a rotating array of six (or eight) lenses. This produces a rotating pattern of 6 (8) pencil beams. The beams can be coloured or blanked off, and the rotational speed adjusted, to give a large number of different characters. The beacon is fitted with a high-current 6-place lamp changer capable of carrying industry-standard pre-focus halogen lamps up to 100 Watts.



²⁰ ibid

²¹ ibid

Vega invented a specialised fresnel lens system and the direct-drive motor in this beacon to overcome limitations with older technology. The fresnel lens takes light radiating from the lamp and "bends" it into a beam that emerges horizontally in a series of parallel rays. Only the upper surfaces of each facet has light passing out through it. Close up the beam has alternating light and dark zones as shown in the photos below. Modern acrylic lenses made in properly-polished dies can give energy efficiencies up to 10 times greater than the traditional cut glass optics found in lighthouses from the 19th and 20th centuries. The quality of a lens can be checked by examining the sharpness and parallelism of the zones as they emerge from the lens²².



1.3.3 LED lights and beacons.

Vega's LED lights and beacons are designed to achieve "lowest total cost of ownership over a ten-year period." This requires strict attention to detail in the management of current, heat sinking and control of LED temperature. Without all of these the promised long life of the LED's would not be achieved. Vega's LED systems extend from a portable landfall beacon that can be secured on-site, to port sector lights and rotating LED-powered buoy beacons and cover different Nm ranges depending on the application. Vega has also designed and built optical projection systems, sighting devices, ellipsometers, and automobile stop light sensors.

Essential to Vega's core operation has been the development of enclosures that ensure accurate optical alignment, and protect the optical elements within from the harshest marine environments. Vega products must also be resistant to shock, vibration, and even electro-magnetic interference. Generally, Vega's products consist of non-ferrous materials suitable for extended exposure to the elements; beacon systems are constructed primarily from optical glass and moulded acrylic elements.

To ensure that its products are the most practical and reliable in the market, the company designs and builds its own electronic control systems, and develops its own circuit board layouts. Efficiency and space-saving are key criteria.

“I could see Vega getting into huge trouble... at that point I decided I would develop my own concept... a universal piece of electronics.” – John Rochfort

Through the use of computer software, Vega’s products can be monitored remotely. The company’s revolutionary VegaMAC system continually reads the status of a beacon, and immediately reports faults occurring on automated lighthouse stations. This system can be installed on any lighthouse, regardless of its current lighting and power systems. Vega is the only company in the world possessing such advanced technological and optical capabilities.²³ The system allows those running beacon networks to monitor and control each beacon from a central control centre, effectively reducing the number of false call outs, and identifying faults that need manual attention. Crews can then prepare the tools they require without first having to visit the beacon.²⁴

Vega’s Martyn Cook explains that even though their equipment is highly precise and highly technological, it is simple to use, elegant and reliable. Thus it provides enough useful information to give a good return on the capital investment.

“We try to make it easier by reducing some options (for our customers) by making more of those decisions ourselves, building it into the product configuration and then not complicating things unnecessarily”.

The New Zealand Marine Safety Authority (NZMSA) estimates that Vega’s information-technology products quickly recover the average cost of \$30,000 for installation because they reduce the need for costly helicopter-assisted maintenance at \$1,250 per hour.²⁵ Any false call could cost up to \$3,500. The VegaMAC system is able to log the previous 32 hours of information for easier viewing and diagnosis of system failures, thus enabling the centralised control centre to determine whether call-outs are necessary. This system uses world-first interactive technology, capable of allowing technicians to switch lights on or off remotely.

Because lighthouse equipment varies from contemporary, to that dating back as far as the 19th century, Vega’s product must be compatible with a wide range of instruments. VegaMAC is

²² Vega website accessed 23 April 2004

²³ **Matla**, S. (1994) “Vega Industries shows the light to US Coastguard.” *Export News*, October 17: p10-14.

²⁴ **Hucke**, M. (1998) “Porirua firm unveils shining light in lighthouse management.” *Infotech Weekly*, April 27: p3.

²⁵ **Anonymous**. (1996) “New Zealand’s lighthouses, leading the world.” *Seafood*, December: p14.

designed to sit alongside various technologies such as weather reporting instruments, tidal and temperature gauges, and to effectively monitor their performance, along with lighthouse performance.

Vega's most prominent contract to date has been the development and manufacture of a major lighthouse beacon for the U.S Coast Guard. This beacon had to meet the rigorous requirements of being solar-powered, producing a signal visible from 26Nm, at 1 rotation per minute, using a bulb not exceeding 250 Watts. This system was required to be self-sufficient for at least 12 months.²⁶

“We had a 78% change in growth when we got that contract in America... we did cope, only just, but we did cope... I mean Vega's a very small company to do that sort of major development but we have always got it done on time.” – John Rochfort

Vega's XAB-17 prototype beacon exceeded all expectations. It is capable of sending a signal 27 nautical miles, at 1rpm from a 180 Watt lamp, wattage close to that of an ordinary household bulb. A multiplexer within the system checks that each light head ignites and runs; when a head fails it is shut down and the next one enacted. This makes the system maintenance free, barring a major emergency, for at least 12 months.

When the XAB-17 proved too “high-tech” for the maintenance organisation in the United States, Vega was invited to look at the design of the smaller 18-mile beacons that had been proving unreliable and troublesome in service. Having established customer credibility with the XAB-17, Vega went on to design the smaller VRB-25, increasing the range from 18 to 20 nautical miles (which required more than doubling the intensity while still using a 100 Watt lamp). To achieve such impressive results, Vega had to develop a method for moulding acrylic that would be accurate to a width of one thousandth of a millimetre²⁷. It achieved this in conjunction with Hella New Zealand.²⁸

The VRB-25 Beacon, which is portable, has been designed to operate in all weathers, from –24°C to +65°C. It is able to operate in 100% humidity, in harsh sunlight and salt-laden seas. If any problems occur the beacon automatically sends off an emergency signal to an on-land monitoring station, which screens the signal to determine the type and nature of the fault, and thus the potential

²⁶ **Hutching**, G. (1995) “Leading Lights.” *North and South*, February: p7.

²⁷ Ibid.

²⁸ See Appendix

remedy. More than 300 of these beacons were supplied to the United States Coast Guard during the 1990's to replace existing beacons.

1.4 The competitive environment

According to Martyn Cook, Vega has three distinct competitor groups. The first comprises multinational companies with a very strong market presence and a long history. The second are companies similar in size to Vega, with a limited range of products. However, most of these are focused on their domestic markets, where they have a little pocket of expertise within the industry. The third group comprises “backyard” companies that occasionally purchase parts from Vega.

Vega's main competition comes from the second group, viz. similar-sized companies with a focus on innovation. However, many of these companies are strong in electronics, with comparatively poor optical performance.

“Vega traditionally has had a strong optics base through Norm Rumsey and John Rochfort who have been able to take the designs and make sure they were practical enough to use in the marketplace.” – Martyn Cook

Vega takes an honest approach to business, being willing to recommend a competitor's product if it offers a better solution to a customer's problem. This approach poses a number of difficulties, of which keeping the rest of the market honest is key.

“Another thing that's pretty difficult in this business is trying to keep everybody honest because they're not... Managing that part of the business is quite difficult, trying to keep everyone honest” – John Rochfort

As Vega educates its customers, they in turn increase the pressure on competitors to remain honest.

The niche in which Vega operates is, to a certain degree, protected by the small size of the potential consumer base and by the technologically sophisticated nature of the products.²⁹

“The markets we are dealing with are very thin... there's only one or two customers in most countries... it doesn't really matter where you are, most of your market is somewhere else.”
– Martyn Cook

The technology employed by Vega would take considerable time and expense to replicate. Because the market is characterised by high entry costs and limited size, it does not present an attractive

opportunity for potential competitors. In addition, ongoing development and innovation has made Vega's products increasingly popular among its consumers, and more difficult to copy or compete with.³⁰

2. Competitive Advantages

2.1 Culture of innovation

Most of Vega's products have a service life of around 20 years. Thus the company is driven by the ongoing need to break into new markets and develop new products.³¹ The requisite climate of continuous innovation is fostered at Vega by a commitment to research and development. Products developed or invented over the last three years generate over a third of sales.³² Each new product is designed for precision and high-performance, reflecting years of company experience, innovation and a little 'Kiwi ingenuity'. John Rochfort sees this research and development as crucial for the further future-proofing of Vega Industries.

"They all tried to make an LED beacon like our one... I heard through the grapevine that some people looked at it and said well that will never work... Ours also has a hole through the middle so you can stick it on a pole and then you can do a whole lot of things you can't do with other suppliers'... Everything is inter-related with all the other bits... it's what I call concept design." – John Rochfort

New products generally remain within the realm of Vega's core business, where Vega maintains an edge in both experience and knowledge. Nonetheless, where new technology is a viable money earner, Vega has no problems with venturing outside its specialist discipline, although these developments are afforded a lower priority.³³

Because not many firms work on lighthouse optics, those that do, tend to keep in touch³⁴ improving knowledge transformation and idea development. Thus the industry is both collaborative and highly competitive. The "International Association of Lighthouse Authorities (IALA) has an "industrial member" category which facilitates collaboration among the more competent and experienced suppliers of equipment.

²⁹ **Anonymous.** (1992) "Vega's a leading light." *The Dominion (Business Outlook Supplement)*, May 29: p14.

³⁰ *Ibid.*

³¹ **Fletcher, R.** (1996) "Vega's export success continues to shine." *Export News*, November 25: p5.

³² **Anonymous.** (1995) "Kiwi Beacons for US Coastguard." *New Zealand Business*, November: p19 (supplement).

³³ **Harrington, D.** (1999) "Futureproof Positive." *New Zealand Management*, 46(2): p38-41.

³⁴ **Campbell, G.** (1993) "Bright Light, Big Future?" *Listener*, September 4: p26-27.

“Two things that have happened. One is that we’ve got to know more and more people around the world. The other thing is that because the world is getting smaller and smaller communication wise, they are talking to each other and I think that you’re getting it both ways there.” – John Rochfort

John Rochfort has been a driving force in company innovation. If he were to leave, Vega would lose a large portion of its specialist knowledge. To counteract this vulnerability, Vega is recruiting highly qualified employees.

2.2 Relationships

2.2.1 Suppliers

Vega acknowledges its need for a supporting infrastructure to supply those components for which it has neither the machinery nor the experience. These include the motor systems, special casings, plastics and optical lenses for its lighthouse beacons.³⁵ The company sources almost all of these components from domestic suppliers, to create products that are almost wholly New Zealand made and manufactured. Vega functions as the hub for this network of suppliers.³⁶ More recently Vega has designed complete kitset aluminium lighthouses up to 20 metres tall, able to be hand-carried up unformed tracks in remote areas like Sabah in East Malaysia. Fabrication of six lighthouses was subcontracted to local engineering companies, who become “exporters” by virtue of their contribution to this project.

An important relationship is with associated company, Industrial Optics Ltd.³⁷ run by Bob Barnes (involved in the development of the original sector light), and situated in Paekakariki, just north of Vega’s plant in Porirua. Industrial Optics has worked with Vega since the company’s inception, providing the optically-worked glass lenses and mirrors used in Vega’s products.³⁸

2.2.2 Customers

Vega has been able to capture a substantial proportion of its market niche through absolute attention to the customer’s needs and a willingness to tackle difficult problems.³⁹ This was evidenced by its ability to provide a product on time to the U.S Coast Guard that exceeded its

³⁵ **Hutching, G.** (1995) “Leading Lights.” *North and South*, February: p7.

³⁶ **Fletcher, R.** (1995) “Reef the spur for Vega Industries’ Sector lights.” *Export News*, October 30: p5.

³⁷ **Fletcher, R.** (1995) “Reef the spur for Vega Industries’ Sector lights.” *Export News*, October 30: p5.

³⁸ **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

³⁹ **Anonymous.** (1996) “Lighting up new markets.” *New Zealand Business*, December: p21 (supplement).

design brief, as Martyn Cook says, *“It’s a matter of being able to do different things for different people”*.

Special projects often arise when existing products do not meet customer needs. In some cases existing products can be extended or modified; in other cases brand new products must be developed.

“When that’s not going to solve the problem the thing then is how can you get something that’s never been done before and actually do exactly what you want, that’s maybe only got two services, and its part of the whole thing. It’s a whole concept... what you do is you say well if I want to achieve this all of the things have all got to interact.” – John Rochfort

These experiences have further enhanced Vega’s innovative abilities and international reputation. Isolation from world markets makes it difficult for Vega to develop high levels of customer contact, or an appreciation of the varying environmental conditions in which customers wish to use its products.⁴⁰ To overcome this, the company has begun an employee immersion programme, designed to expose newer employees to their major customers in a more direct fashion. It is hoped that through direct contact, employees will develop a refined understanding of customers’ wants and needs.⁴¹

Vega initially used distributor Pharos Marine⁴² as its international agent, but in order to work more closely with customers has since established its own network of agents. These have been carefully selected to enhance Vega’s reputation and distribution.

“When people want to be our agent or an exclusive distributor we insist that they have no conflict of interest with any of our product line, and we try to keep our own product focus tight enough so that it makes logical sense and that there are complementary businesses.” – Martyn Cook

“Because our product is all about educating customers, and persuading them to move away from the traditional two light alignment system to a single sector light, there’s quite a lot of investment required at the front end by an agent or distributor, and if that agent or distributor then finds that the job goes out to tender, he has to put in a price that enables him to recover the cost of all the time he has invested. If he doesn’t get the job and someone else does because they can go and buy from Vega as well, then what you are going to find is that no one is going to put in the effort... we had to make it attractive for agents to work for

⁴⁰ **Anonymous.** (1996) “A Beacon for young engineers.” *New Zealand Business*, December: p16 (supplement).

⁴¹ **Fletcher, R.** (1996) “Vega’s export success continues to shine.” *Export News*, November 25: p5.

us, and what we decided was, or what we were persuaded of was that if we reduced the number of people and appointed exclusive agents, then they would be better off.” – Martyn Cook

Key customers, such as the U.S Coast Guard (USCG), have been given the option of dealing directly with Vega. Vega maintains a good working relationship with the USCG, widely recognised as the world’s most demanding user of marine beacons.⁴³ Vega’s bid to supply further medium range lighthouse beacons (VRB-25) to the USCG was accepted, despite complaints from the former supplier that the USCG had not honoured the “Buy America” policy (essentially a 15% tariff on imported items). The relationship is one of mutual respect. Vega views the U.S Coast Guard as a “competent customer”⁴⁴, that is one who fully appreciates the product, and can participate in product development through offering suggestions for improvement.

“The second thing is finding the customers that are just as competent. In other words the customer needs to be competent themselves to recognise what Vega’s doing and also assertive enough to actually say what they want with knowledge, and that is where the U.S Coast Guard has been very important to Vega because the U.S Coast Guard knows what it wants. It will test it, it knows when it gets it and it knows when it gets the answer, and when it does get the answer it will buy.” – Martyn Cook

The relationship is also one of mutual education:

“We said to them, you should really change your way of purchasing so that you don’t buy on the lowest price because you need to understand that the cost of a single maintenance visit can exceed the purchase price... we suggested the U.S Coast Guard look at whole of life costing... so I believe we had an influence there in changing the way they thought about purchasing.” – Martyn Cook

The USCG is so pleased with the performance of Vega technology that it committed to replacing all of its medium-range lighthouse beacons regardless of condition over a five-year period, worth over \$1 million in revenue to Vega.⁴⁵ USCG’s recognition of Vega’s products has served as a strong recommendation to present and potential customers, and has enhanced Vega’s reputation for top quality products.⁴⁶

⁴² See Appendix

⁴³ **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

⁴⁴ **Fletcher, R.** (1995) “Reef the spur for Vega Industries’ Sector lights.” *Export News*, October 30: p5.

⁴⁵ **Finnegan, A.** (1995) “Hard work pays off for local firm.” *The Evening Post*, October 18: p13.

⁴⁶ **Matla, S.** (1994) “Vega Industries shows the light to US Coastguard.” *Export News*, October 17: p10-14.

2.2.3 Manufacturing

Because Vega's products are niche products, and therefore very customised, and increasingly complex, manufacturing requires a "tight degree of control" says Mr Cook. For these reasons all Vega's manufacturing is done in New Zealand.

"I don't believe it's the sort of product that would lend itself to manufacture in a lower cost country. In fact New Zealand isn't that high a cost country [for manufacturing] at the moment," Martyn Cook

Manufacturing in New Zealand is not a disadvantage despite the distance to markets. Vega prices its products in US dollars, has reasonably good outgoing freight rates to most parts of the world, and a very fast response time to customers.

Vega does its manufacturing using four modern CNC (computer numerical controlled) machine tools – lathes and milling machines. The first machine was bought in the mid 1990s to allow the company to keep costs down and quality up. Typical customer lead-time is about **4-8** weeks. Because of the large number of different configurations offered by Vega, most products are partly-built up to the stage where their final configuration is determined. Then when the order comes in, the parts are completed to the customer's specification and the product assembled, tested and delivered.

"It was very much John's conviction that that was the way to go and that...to keep making things manually in a third-world-style, in a country that was not a third world country, was not feasible." Martyn Cook

With the introduction of the CNC machines, the company suddenly had a lot more capacity but didn't have the quantity of work to utilize it. It therefore took on contract work for companies such as the New Zealand Lighthouse Service to pay for the new machine tools until the internal production workload caught up. Another challenge was Vega had to re-design its product range so it could be made economically on the CNC equipment. Vega makes almost all of its machined metal and plastic parts and components in-house.

The benefit of the CNC machines is they "perform quickly and accurately, with perfect repeatability. Sound knowledge of suitable materials and how to process and protect them is an important element in Vega's successful designs. Even the manually-operated milling machines

used for prototyping work have digital readout on three axes for precision positioning.”⁴⁷ The development of LEDs, a smaller light source with a very long life, introduced Vega to mass production.

Photometric tests, which use computer software, are performed on all Vega beacons. A calibrated ‘zero-range’ light tunnel stimulates how a light performs when viewed in the far field. This simulates what a signal light would look like to a distant observer while making the measurement at very close range, “The computer captures thousands of intensity readings per second as the beacon rotates, and automatically prepares a test report incorporating the intensity profiles and comparing results against pass/fail criteria. The tunnel is also used extensively for research into new products”⁴⁸.

An environmental testing chamber is used to ensure the light output and electrical stability of Vega lights are consistent in conditions of tropical heat, icy cold, high humidity and persistent salt spray. The chamber tests products at -40°C and 100% relative humidity. Vega products are also tested for degradation, corrosion resistance and sealing against moisture ingress.

“Vega is certified to the ISO 9001 International Quality Management system. Procedures used in purchasing, designing, manufacturing, assembly and testing are documented and routinely audited.” A permanent record of all products’ design calculations and test sheets is kept; as are calibration results for all measuring instruments used during manufacture.⁴⁹

In 2001 Vega doubled its factory size and separated the machine shop from the assembly and testing areas. This enabled Vega to acquire additional CNC machine tools, and also expand its testing and research facilities, including installing a new photometry range and an environmental testing chamber.⁵⁰ With international demand for a number of its products, including railway-crossing lights, increasing the factory could require further expansion.⁵¹

2.3 International leadership in the industry

Vega has established a reputation world wide as an international leader in marine navigation solutions. Many elements of the company’s performance contribute to this reputation:

⁴⁷ Vega Navigation Lights corporate brochure

⁴⁸ *ibid*

⁴⁹ *ibid*

⁵⁰ Vega website accessed 26 April 2004

- a distinctive knowledge in optics
- superior products
- an honest and innovative approach to meeting customers' needs
- strong relationships with key customers
- high levels of competency and reliability in implementing projects.

“The strength that we have is that we have enough knowledge in the company to convince the end-user that we know what we are talking about.” – John Rochfort

Vega's policy of delivering its goods on time furthers its reputation as a reliable, competent supplier.⁵²

“People often find that they get a better response over the other side of the world from Vega compared to their own companies, companies in their own country.” Martyn Cook

Vega has been leading the industry ever since the development of its original product, the PEL Sector light. This product was revolutionary, and as such was initially met with some scepticism and market resistance. However, it has become a highly successful product, enhanced by ongoing development and refinement. Competitors without comparable optical skills have been forced to follow behind.

“The sector light is still the most high tech and no one has really been able to get near us, we make all of them and we make a huge range and different angles.” – John Rochfort

“Vega is the only company in the world that can build those lights to that standard.” – Martyn Cook

Vega's reputation for precision, quality and robust products was evidenced when it was the only company awarded with a “design and build” contract in 1990 for the signalling searchlights for the ANZAC frigate, despite initially lacking ISO9001 quality accreditation. The searchlights developed for the frigate can withstand an onboard explosion and still operate as normal.

The company's profile overseas tends to sell its product through spin-off contracts.⁵³ Vega, perhaps out of pride in its products, is committed to fixing any problems that arise. Mr Cook gives an example using an incident of a Vega -made sector light that didn't function as the Miami customer expected, despite it being made to the customer's specifications. Mr Cook details how he rang the

⁵¹ **Anonymous**, 17 Sept 2001, “Brighter lights to illuminate rail crossings, *The Dominion*

⁵² **Anonymous**. (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

firm in question post-installation to check the light was working only to be told that despite it working as specified the pilots were not satisfied with it as it did not do what they expected it to. To fix the problem, despite the customer having no budget to do so, and it not being Vega's fault, Mr Cook re-routed a flight through Miami and modified the light so it would do what the pilots expected. As a result of this 'beyond the call of duty' service Vega, in addition to satisfying the initial customer, also gave confidence to the US Defence Department when a later contract was being negotiated. The Defence Department heard of the incident and decided Vega was the type of company they wanted to deal with⁵⁴.

3. Company History

Initiated by a mechanical engineer, a lens-maker and a businessman, Vega Industries Limited was established in 1972 to develop further and commercialise the Physics and Engineering Laboratory (PEL) Sector Light. Norm Rumsey, Head of Optics at the Department of Scientific and Industrial Research (DSIR) originally developed this light⁵⁵ The Vega PEL Sector Light was initially designed for the specific difficulties associated with Porirua Harbour, where two lights could not be aligned because a cliff at Goa Point left no physical space to place the rear light in a 2-station "alignment" system. Sector light technology sends only one light beam, but this changes colour depending on whether a vessel is too far left (red), on course (white) or too far right (green).

Vega quickly moved into the export market, a move reflecting the limited nature of the New Zealand market.⁵⁶ But the PEL technology initially met with resistance due to its revolutionary nature, and the relatively conservative nature of the lighthouse industry.⁵⁷ To overcome this problem, Vega concentrated on those customers it felt held sufficient technological capabilities to appreciate their product. Through supplying these leading consumers initially, Vega enhanced its reputation and now supplies most of the world's precision sector lights.⁵⁸

The road to the top has not always been easy for Vega. John Rochfort's early years with Vega were characterised by financial highs and lows. The initial shareholder group was unwilling to invest in research and design, preferring to focus on profits. These shareholders were bought out by another

⁵³ **Harrington, D.** (1999) "Futureproof Positive." *New Zealand Management*, 46(2): p38-41.

⁵⁴ Interview with Martyn Cook 29/01/01

⁵⁵ **Fletcher, R.** (1995) "Reef the spur for Vega Industries' Sector lights." *Export News*, October 30: p5.

⁵⁶ *Ibid.*

⁵⁷ **Anonymous.** (1996) "Lighting up new markets." *New Zealand Business*, December: p21 (supplement).

⁵⁸ **Daniels, C.** (1997) "Porirua company sheds new light on beacons." *The Dominion*, June 20: p3.

group of shareholders willing to invest in research and design, but the new group lacked the wealth of industry knowledge of the previous shareholders. Through the steady success of the PEL Sector Light Vega was able to finance new research and design initiatives, which have cumulatively enabled Vega to overcome those initial difficulties.

In 1992 Vega was commissioned to design and manufacture a major sector light to operate day and night for Port Botany in Sydney, near Sydney airport. Because this light would shine out over the Sydney airport runway, all stray light had to be contained. It took ten years of research and experimentation on the part of the customer before Vega's solution was finally considered and accepted, showing Vega's diligence in addressing difficult problems that other firms in the industry tend to side-step.⁵⁹

In another major project, Vega provided a set of sector lights for the Terneuzen locks in Belgium.⁶⁰ Vega lights enable the huge ships using this channel to align themselves and enter the canal that at times allows for only a metre clearance on either side of the 40-metre wide lock.

Recognising that its quality products had to be sold and distributed effectively, in 1992 Vega appointed a sole distributor, London-based Pharos Marine. In partnership with this distributor, Vega established a worldwide sales and distribution network, with sales to Pharos-affiliated companies doubling for the first three years after the agreement was signed.⁶¹ However, owing to the different manner with which both companies operated, in the end Vega had no choice but to develop its own distribution network, one that could be more effectively controlled.

“There were good parts and bad parts to that arrangement (with Pharos Marine). The good parts were that they did some serious promotion and sales did increase. The bad part was that they tended, because they were a big company, to take liberties of licence that we weren't always happy with.” – Martyn Cook

“As our sales increased and we gained a bit more confidence, we set a whole new strategy to set up our own distribution network. We would control it and we would move away from dependency on large multinational companies to do our marketing for us.” – Martyn Cook

1993 was one of the most important years in Vega's 20-year history. In that year Vega delivered its first consignment of VRB-25 Landmark Beacon lighthouses to the US Coast Guard. The company

⁵⁹ **Anonymous.** (1996) “Lighting up new markets.” *New Zealand Business*, December: p21 (supplement).

⁶⁰ **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

spent 12 months testing the design, leaving only three months to manufacture and deliver the first batch of beacons and remain on schedule. The U.S Coast Guard was so impressed it offered further work to Vega.⁶² In 1994 Vega supplied special signal lights to the Port of Hong Kong, which included remote control and monitoring interfaces. These beacons were to be visible night and day.

Reducing the costs of lighthouse maintenance required the development of automated lighthouses that could be monitored from a central control unit. In 1996 Vega was commissioned to develop a remote monitoring⁶³ and control systems for the New Zealand Maritime Safety Authority (NZMSA), a significant product enhancement to assist in the monitoring of its automated beacon network.⁶⁴ It took two years for Vega to develop the system. The product developed for this contract, VegaMAC, has been a significant advance from previous monitoring methods, and leads the world in automatic electronic lighthouse control. The NZMSA network that Vega's products monitor and control is also considered world-leading.

Vega's products have become increasingly popular due to industry-wide change, which has resulted in most, if not all countries, eliminating their use of manned lighthouses.⁶⁵ This shift has presented Vega with a burgeoning potential market. Vega systems have saved its customers hundreds of thousands of dollars in maintenance costs.

“One of the major problems of having thousands of lights around the place is maintaining them because the lamps only last a certain amount of time they are very expensive... LEDs provide the ability to increase this lifetime, because its not actually paying for the lens, its going to them and then replacing the lens... but the navigation industry is also very careful about taking on new technology because they don't want accidents.” – John Rochfort

Many of Vega's contracts have been obtained by potential customers viewing Vega's products in action. A \$100,000 Egyptian export contract for coastal safety led to interest from both European and African nations.⁶⁶ Even countries as small as Tahiti present useful networking opportunities.

“That network is the legwork for the next network, as far as Tahiti talks to France, they talk to other places that are French.” – John Rochfort

⁶¹ Ibid.

⁶² **Anonymous.** (1995) “Kiwi Beacons for US Coastguard.” *New Zealand Business*, November: p19 (supplement).

⁶³ See Appendix

⁶⁴ **Hucke, M.** (1998) “Porirua firm unveils shining light in lighthouse management.” *Infotech Weekly*, April 27: p3.

⁶⁵ **Anonymous.** (1992) “Door Opens on US Market.” *New Electronics*, May: pp1, 38.

⁶⁶ Ibid.

Through extensive research and development, Vega Industries has made significant contributions to the field of optical engineering and energy efficiency, resulting in recognition through the ECNZ Rutherford Award for Energy Efficiency in 1994, for which Vega received \$20,000. Vega also won the Air New Zealand Award for a Small Business Exporter in 1995 and 1996, and the inaugural Porirua City Business Awards “Supreme Award” (also in 1996), reflecting its highly regarded ability in exporting.⁶⁷

Vega has overcome both the initial resistance to its first product, the PEL Sector Light, and the constraint of distance from markets, to become the light manufacturer against which all other suppliers are measured.⁶⁸ Its specialised optical solutions have captured the niche market for highly specialised marine beacons and are used in many countries and every continent worldwide.

4. Conclusion

Vega Industries Limited, with humble beginnings on the shore of Porirua Harbour, has become a shining light for New Zealand exporters. Their ‘cutting edge’ optical and technological lighthouse and beacon solutions have revolutionised port, harbour and shoreline safety throughout the world by providing efficient, reliable and precise beacons capable of operating automatically. Their VegaMAC computer system is the world-first in computer monitoring of lighthouse systems.

With a special blend of optics, engineering, business and Kiwi ingenuity, Vega Industries has become one of the world’s most reputed suppliers of marine beacons, and currently maintains some of the world’s most demanding customers on its client list. The company’s ability to develop revolutionary systems has been fostered largely by managing director John Rochfort, who has lead the company for over 20 years in seeking innovative and practical ways to meet the world’s most challenging beacon needs.

Winner of numerous export and business awards, Vega Industries competes successfully in a competitive international environment. Helped by the fact that it dominates a market niche made difficult and costly to enter because of its small size, and the technological capabilities demanded of firms, Vega has secured contracts through attention to detail and quality products. Through successful relationships with suppliers and customers, Vega products, which are almost entirely designed and manufactured in New Zealand with New Zealand parts, have been efficiently distributed throughout the world.

⁶⁷ **Anonymous**, (1996) “Vega judged leading Porirua light.” *The Evening Post*, June 17: p13.

⁶⁸ **Hutching, G.** (1995) “Light Years Ahead.” *New Zealand Business*, March: p12.

A strong emphasis on research and design, and finding out exactly what the customer needs, have created a reputation for Vega as a quality, competent and leading supplier of marine beacons internationally. The company's story shows just what can be done despite the small size and relative geographic isolation of New Zealand.

5. The Future

Vega's story is certainly one of a New Zealand firm overcoming barriers by providing a superior product and unparalleled service, but its story does not end here. Vega, through continued research initiatives and high levels of customer interaction, is looking to constantly improve on its technologies and expertise, further pushing boundaries of the marine navigation equipment market. Vega plans to marry the technologies of LED and Sector Light beacons in order to ride another revolutionary wave of success.

"We now have a second key technology which we are chasing along the track. We are building bigger lights, more powerful lights. We hope to build a sectored light using LEDs, which is technically very, very difficult, but if we can do that we can bring back this new innovation to the other core technology. We want to own part of the market in terms of reputation." – Martyn Cook

In John Rochfort's view there is no shortage of new products that Vega has the capabilities to make. The challenge is to expand operations so that these products can be developed, whilst also maintaining the high standards that Vega for which is globally recognised.

"There's a lot of new products that Vega have made or that we can make that would do really well overseas that I can't get the time to do. It's just we've got all these other ones that we need for business, pepper and salt."

Rochfort also does not fear possible substitutes:

"I don't honestly believe that GPS will ever solve [the navigation problem] because ... we've already had three major accidents in the last couple of years [late 1990s and early 2000] because somebody used their GPS. Visual aids have remained. What you can see is really the best".

Vega continues to introduce new aids to marine navigation, aimed at increasing performance and reliability while reducing whole-of-life cost to its customers. The company believes the shipping

industry faces many new challenges, as larger vessels try to squeeze into existing ports, and the ports and inland waterways continue to develop and grow. Increasing background lighting in many ports means that signal lights need to be brighter and better located. The pressure is on to produce signals which are more energy efficient, more robust, more reliable and better engineered, and Vega intends to play a leading role in these developments⁶⁹.

⁶⁹ Vega website accessed 26 April 2004

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7. Appendix

PEL Sector light:

A sector light is a projected light that shows a different colour when viewed from different angles; the colour of the light provides directional information to mariners. This equipment is so precise that a complete colour change will occur over an angle of less than $.02^\circ$ corresponding to a distance of just one metre when viewed from a distance of 3.5km.

Sector lights are most useful where a conventional two-station light is impractical or uneconomical. Such areas include high peninsulas or amongst cliffs, where two lights cannot be aligned. Low levels of stray light emitted allow PEL sector lights to be more easily concealed, and their energy efficiency, and requirement of only one station add to the cost savings.

An oscillating boundary system is employed by Vega, by which the proportion of each 3 second light-cycle spent in either of the colours indicates even more precisely, slight deviations from the white “safe” sector. However, colour change must remain abrupt to allow an easily distinguishable change for mariners.

Using a projection method, similar to a movie projector, highly polished optically ground filter glass is used to divide the beam. Sector lights can be used both day and night, however those working during the day require a higher light intensity than at night.

VRB-25 Rotating Beacon:

The specialised fresnel optics and the low-speed direct-drive motor were both invented by Vega. The fresnel optical lens maximizes output from industry standard signal lamps, and a specially adapted motor provides high levels of torque, whilst consuming very little energy (1-2 watts). Lamp changing, solar switches and motor drive are controlled by a microprocessor based electronic controller, which is housed in a metal capsule.

For easy maintenance, a small removable hatch giving instant access for lamp replacement covers the VRB-25. The electronic controller can be removed from the base and the glazing assembly also lifts off. All parts of the beacon are scheduled to last for 20 years without replacement except for lenses and glazing, which have an estimated lifespan of 5-7 years.

Hella, New Zealand:

Hella International is a worldwide supplier of lighting and engineering solutions largely for the motor industry. Hella New Zealand, which is incorporated under this global umbrella, was formed in 1973 and operates as part of the Asia Pacific group. The New Zealand division specialises in innovative lighting products for use in commercial transport and automotive sector using LED (light emitting diode) technology, and supplies this equipment around the world.

AB Pharos Marine:

Pharos Marine has over 80 years of experience behind its products. Created by Nobel Prize Winner Gustav Dalen, their product range includes marine beacons of all types. They supply major lighthouses, radio beacons, motorway signals, and remote monitoring and control systems (an area of Vega's expertise).

In 1989 Pharos Marine merged with Automatic Power Inc., a Houston Texas based company, to become the world leader in navigational aids. Their service covers installation, design and contracting suppliers, and also includes the training of technicians as well as providing their own technical support for all products.

Remote monitoring:

Remote monitoring has become a popular, low cost and energy efficient method of monitoring marine navigation equipment. The computer-based network, which can be connected via mobile phone or UHF radio signals, is capable of providing instant responses to faults. The system is expandable to monitor other equipment such as weather and tide gauges.

Using the VegaMAC system, information is presented on a computer screen at a base station, one base station can monitor up to 100 outstations at any one time.