

Tel-Aviv, Israel.
(Inset) Engineers
assemble optical
amplifiers at RED-C.



Telecom in Tel Aviv

The Story of RED-C Optical Networks, Ltd.

Jennifer D.T. Kruschwitz

An Israeli company has built a solid foundation in a field where many of their previous competitors no longer exist.

In 1996, Uri Ghera completed his Ph.D. at Israel's Tel Aviv University and joined Electro-optics Industries, Ltd. (Elop) to build up their optical laboratories. Ghera headed the optical fiber activities at Elop for communications and military applications.

Yossi Boker joined Elop two years later. His aim was to find commercial applications for some of the company's military technologies. Boker was the director of business development, and he was also responsible for the optical laboratory. Both labs had a dearth of technical people and equipment.

In 1998, representatives from Elop met with the founders of Chromatix to discuss a potential partnership. As a result of the meeting, Chromatix decided to

outsource their entire optical system development to the optical lab. (Chromatix was later acquired by Lucent for \$4.5 billion.) Boker now had the funds he needed to recruit qualified engineers and scientists for his and Ghera's laboratories. The added resources also enabled them to understand better the challenges for communication systems in optical networks.

At that time, many optical component technologies were not yet mature. This gave Boker and Ghera the opportunity to focus their efforts on learning about failure mechanisms in optical components and developing testing methods that would help guarantee reliability with their products. Their main goal was to build a reputation for being a reliable supplier.



Berl Berger

Boker initiated a spin-off from Elop in 1999, and was responsible for finding financing sources. MRV Communications—a public company from the United States—put seed money into Boker's spin-off. In March 2000, Boker and Ghera launched their new independent company, RED-C Optical Networks, Ltd.

From the beginning of this new venture, RED-C was a true industrial organization. They focused the majority of their efforts on R&D and developing an infrastructure for large production. The funds raised were used to hire exceptional technical staff, facilitate R&D efforts and construct an infrastructure. The company established a conservative budget policy. The team at RED-C was driven by quality and reliability. They focused on prod-

ucts that were straightforward to support in terms of production and reliability and that added value for their customers.

RED-C included many talented and devoted professionals who would become vested in their company. Their investors originally requested that they build their operations in countries other than Israel. But Boker and Ghera knew that Israel held many benefits for RED-C. An Israeli company would have lower operational costs than one from the United States or Europe, for example. Another huge advantage is that the Israeli government subsidizes 50 percent of all R&D efforts.

In 2001, RED-C released its variable gain EDFA (erbium-doped fiber amplifier), which was the first of its kind on the market. This product provided a 12 to 14 dB dynamic range of gain while preserving the optical performance of noise figure and flatness. Traditionally, fixed-gain EDFAs had good performance as long as they operated within a very limited gain range, while the performance deteriorated as time passed if the amplifiers were operated at differing gain ranges than originally specified.

Thus, fixed-gain EDFAs did not provide enough flexibility for the customer. RED-C's variable-gain EDFA allowed the company to infiltrate tier-1 customers, offering them enhanced performance with increased flexibility.

In 2003, the company released its Raman amplifier, which amplifies the transmission signals by directly pumping high energy into the transmission line itself. This is caused by stimulated Raman scattering, which transfers energy from the pump to the signals.

A large percentage of competing telecom companies had abandoned the use of Raman amplifiers due to concerns about eye safety. Given the high power that the Raman amplifier pumps into the transmission line, people feared that a technician might inadvertently detach a connector during operation and become exposed to radiation. RED-C built a reliable mechanism into their Raman amplifiers that would sense any interruption in the transmission link, and automatically shut down the amplifier.

Once the eye-safety issue was resolved, the development of Raman amplifiers in Europe and North America progressed rapidly. In most cases, the Raman amplifier is deployed together with EDFAs to enhance the transmission signals, thus enabling links that would not otherwise be feasible.

RED-C launched its self-managed EDFA in 2004. This device had an OCM (optical channel monitor) integrated within the EDFA. In previous generation devices, the amplifiers had no information regarding the spectral composition of the signal, or the power of individual channels. By integrating an OCM, the self-managed EDFA allows the amplifier to close the spectral loop, and thus optimize its performance in response to changing conditions in the system.

The OCM also allows the amplifier to control other optical devices, so that the self-managed EDFA now becomes a central controlling element in the optical network. Finally, the integrated OCM saves the need for an external OCM, thus conserving space and reducing the overall system cost. To implement a cost-effective OCM, RED-C chose to use a tunable filter with the self-managed EDFA.

However, it was necessary first to overcome a well-known reliability issue—the fact that tunable filters tend to change their setting with time. To tackle this problem, RED-C built a mechanism within the amplifier that continuously calibrates the tunable filter to keep the OCM reading accurate.

The company has succeeded in increasing sales and has been profitable since 2004, with promising prospects for the future. In 2004, Boker and Ghera, backed by the Cedar Funds, completed a management buyout. They now share ownership with the Cedar VCS. They believe that having customer trust in their products and eliminating traditional optical component failure mechanisms are the best ways to sustain their company in the future. ▲

[Jennifer D.T. Kruschwitz (jkconsult@kruschwitz.com) is senior optical coating design engineer at her own company, JK Consulting in Rochester, N.Y.]

Tunable Lasers



Tunable Lasers

- Benchtop R&D Laser Sources Covering the Wavelength Range from 635nm to 2.0µm

Continuously Tunable Mode Hop Free Lasers

- High Performance Swept Sources Optimized for Heterodyne Applications

MID-IR Tunable Lasers 1.32µm-5µm

- PPLN Based OPO
- 1320nm-5µm Covered by Three Models
- Output Power >3mW

USB Benchtop Tunable Laser

- Internal and External Wavelength & Power Modulation
- Sweep & Step Mode Operation

hungry for your thoughts...



Share your product ideas
www.thorlabs.com



visit us on the web
www.thorlabs.com
Call a sales representative at:
973-579-7227

Request Your **FREE Tools of the Trade Catalog** With Over 10,000 Products.
Order Online at www.thorlabs.com
Over 700 New Products!

THORLABS