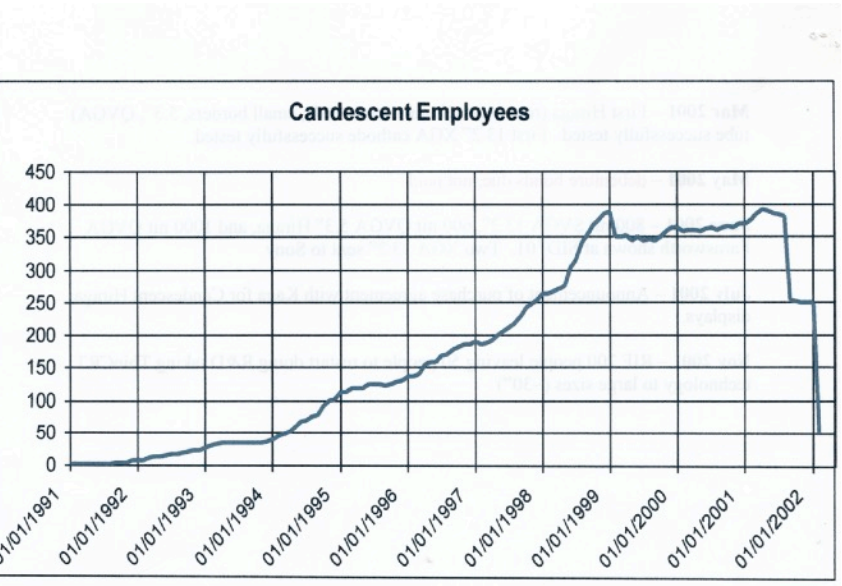
Chapter 16

SVC Candescent Rise & Fall

The up and down of the company from our start through spending $700 million on over 100 really great inventions the agonizing realization that we could never be cost competitive against the new LED technology.



This is a chronicle of the staffing and funding of Candascent over its nine year history. The early years in the details of our starting the company are of interest to me, but probably no one else.

Aug 1988 - Paul Lovoi first wrote down his concept of using multilayer ceramic material as a basis for flat CRT's. Here, a hot "banjo wire" cathode was to generate a cloud of electrons in the area behind a perforated, multilayer ceramic grid. Row and column electrodes between different layers of the ceramic grid and surrounding each hole in the grid were to control the flow of electrons from the cathode through each hole in the grid. Electrons allowed to pass

through a hole would be accelerated to a given red, green, or blue phosphor pixel on an anode plate. The basic concept was described in earlier efforts of Northrup, Texas Instruments, Source Technology, and others. However, these efforts had problems with electrode leakage, fragility of the grid, and focusing and were limited to thick, self-supporting face and backplates. Lovoi (Co-founder and president of InTA, a metal ceramic research and development company), proposed that the recent developments in multi-layer, low temperature, cofired (the electrodes were screen printed between the ceramic layers prior to the ceramic being fired into a rigid structure could solve both the electrical and mechanical limitations of previous attempts at flat CRT's.

Dec 1988 – Lovoi described his idea to Lowell Noble, and Darrell Wilburn at a Christmas party and they decided the idea was good enough to form a company.

1989 - Lovoi, Wilburn, and Nobel requested $1,000,000 from Marko Slusarczuk at DARPA to demonstrate a display based on this ceramic grid technology. Despite his interest, Slusarczuk felt that the project would not fit in any of the three founders companies.

In order to secure this funding, Lovoi et al solicited Robert Pressley to form and staff a new company to exploit the technology. Pressley had just sold his company XMR, a manufacturer of industrial excimer lasers, to Amoco Corporation. Pressley agreed to be CEO.

Apr 30, 1990 – SVC (Silicon Video Corporation) incorporated

Jul 1990 – Proposal submitted to DARPA.

Slusarczuk, Pressley, and Lovoi, started negotiating the proposed contract with the new company. Although Slusarczuk agreed to fund the effort early on, it was not until March of 1992 that DARPA money, administered by the Army, was released to SVC to start work.

Jun 1991 - Pressley, along with Capform Ventures invested $400,000 to start the new company.

Aug 1991 – the company moved into SVC's first offices above the AAA offices on Stevens Creek Road in Cupertino.

By Dec 1991 - Pressley had recruited Bob Duboc from Coloray Display Corporation, Ted Fahlen, VP of R&D at XMR and Chris Spindt (Capp's son) a new PhD fresh from Stanford. Mary Milligan (administration) was also on board. One room was formed into a laboratory with one vacuum chamber. It was decided that a fundamental basis of the technology would be to use high voltage phosphors (>4KV) to take advantage of greater efficiency, longer life, color gamut, and availability. High voltage phosphors are more efficient due to their higher inherent efficiency and because electrons have enough energy to penetrate an Aluminum reflective layer on the cathode-side of the phosphor. This Al layer reflects light towards the viewer that would otherwise be lost back to the cathode. However, the use of HV phosphors required that a tall, thin internal support (to prevent electrical breakdown) must be developed.

Dec 1991 – First electron emission from hot cathode in vacuum chamber. Bill Scannell (laboratory technologist) on board. Realization that resistive coatings would be required.

Jan 1992 – HP and Carl Berg, a Silicon Valley VC and real estate executive, invested in SVC; HP invested $1.5M. The role of Hewlett-Packard was crucial. Richard Hackborn at HP promoted the relationship with SVC because he felt that displays would be very important to the future of HP.

Feb 1992 – Scientific Advisory Board formed with Paul Lovoi and Len Reed of InTA, Larry Hubby of HP, Bob Pressley and Ted Fahlen of SVC; Ben Kazan, Jim Boyden, Jack Gilman, Kanti Jain, and Joseph Pask joined later in the year.

Mar 1992 – Contract and funding from DARPA/Army started. Goal was to fabricate and demonstrate a monochrome 14" VGA display in 12 months using the hot wire cathode and a ceramic grid.

April 1992. Move into a laboratory building on Bubb Road in Cupertino. That was leased from Carl Berg

June 1992 – Chris Curtin came on board, followed by Ron Hansen a month later.

Sept 1992 – John Macaulay, Phil Elizondo on board bringing the total employment to 20.

Dec 1992 – Move into new building across the street on Bubb Road in Cupertino this was a much larger building Also leased from Carl Berg

May 1993 – Scientific Advisory Board agrees with decision to develop the technology around field emission cold cathodes

June 1993 – Harry Marshall, a venture capitalist, hired as CEO,'s responsibility is fundraising. Preswley becomes president.

July 1994 – Series C financing of $13.1M. New Enterprise Affiliates and Sevin-Rosen Management lead investors.

Sep 1994 – The company started moving from Bubb Road to "SJ1", at Via del Oro in San Jose,

Oct 1994 – Technology Reinvestment Program (TRP) administered by DARPA provided a $22M grant to further develop Candescent's FED displays.

Jan 1995 - David Bergeron from IBM hired to be in charge of manufacturing technology.

Apr 1995 – Series D financing of $17.8M from Bankers Trust, Berger Associates, BKP Partners, Compaq Computers, Citicorp, Hewlett-Packard, J.P. Morgan Investment Management, New Enterprise Associates, and 21st Century Communication Partners.

June 1995 – First patent issued.

July 1995 – David White hired as CFO to replace Marshall

Jay 1996 – Series E financing of $55M.

Jun 1996 – High resolution (106 lpi) demonstrated in 2.3” display.

Aug 1996 – The company name was changed from SVC to Candescent Technologies Corporation.

Dec 1996 – The company expanded into a building at San Ignacio Ave) across the parking lot from the Via del Oro facility in order to expand the development line in the SJ1 facility.

June 1997 – Series F financing of $57.1M

April 1998 – Debenture financing of $125M.

Oct 1998 – Two year Joint Development agreement between Sony and Candescent. $100M, half from each company, to fund the effort to develop the technology for a large 12-14” diagonal display.

Nov 1998 – Ground broken for a 311,000 square foot prototype manufacturing plant in San Jose.

Dec 1998 – 50 tubes on life test
First evaluation kit display sold (to CDC)

Feb 1999 – The company was restructured and a RIF was made. David White becomes interim CEO, Harry Marshall becomes Chairman of the Board. There are now 350 employees.

May 1999 – Two excellent quality displays demonstrated at SID ’99 in the Sony booth. First 13.2” SVGA turned on.

Mar 2000 **–** Debenture funding of $85M. 100th patent issued.

May 2000 – Demonstrated 13.2” display at SID ‘2000

Oct 2000 – Signed contact with Sony for extended Joint Development program and Equity investment and License contract for $125M.

Feb 2001 – S1 Registration Statement filed with the SEC

May 2001 – debenture bonds due, not paid

Nov 2001 – RIF of 200 people leaving 50 people to restart doing R&D taking ThinCRT technology to large sizes (~30”) Shortly thereafter the entire staff is let go,

We needed more than twice the $700 million we spent. (just a couple billion dollars

CANDESCENT. R. I. P.

The Japanese did carry on the technology for several years and made a very nice display using our field display technology, but using thick glass to avoid having to use support walls.

While we were doing an incredible technical job solving problems the complicated thin display utilizing the vacuum tube, there was a parallel development using LED (light emitting diodes) a much easier to manufacture display that did not require vacuum technology. It ultimately turned out to be both a better display and a far less expensive technology.

Even that technology has been outmoded by a cheaper better technology called OLED using newly invented organic liquid emitting diodes.