PlasmaSol: Converting Technology into a Company

An Early Case Study in Academic Entrepreneurship

Lex McCusker, Ph.D.
Imccuske@stevens.edu

Science Driven Technology Development and Market Realization

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What is your academic discipline?

1. Science
2. Engineering
3. Social Science (not business)
4. Business
5. Humanities
6. Other

Key Themes in the PlasmaSol Case

- De-Risking the Technology – using grants and other publicly available funds to get closer to a commercial product
- Searching for the Right Market and Application
- The Team
- University Support for Academic Entrepreneurship
What is a Plasma?

- Electrical discharge
- Glows in a vacuum
- Uses of plasmas
  - Cleaning precision parts; laying down layers of paint or protective coatings
- Before 1995, a vacuum was required.
- Plasmas could not easily be generated in gas or liquid environments.

Injection of Plasma-Generated Reactive Species into Liquids

- Technology: Generation of glow discharges in water and air.
- Reactive species include ozone and peroxide
- Potential applications: water, wastewater treatment, disinfection and sterilization, destroy airborne particles

Operating in open air

Operating in liquid
Plasma Without a Vacuum

- Traditional “Plasma Blowtorch” – etching, cleaning and sterilizing surfaces – is now cheaper, easier
- Plasmas can be tuned by changing electrode material and geometry
- Environmental Applications
  - Destruction of airborne contaminants
  - Destruction of volatile organic compounds (VOCs): benzene, toluene
  - Modify automotive exhausts: nitrogen oxide, sulfur oxides, greenhouse gases

The Genesis of PlasmaSol

- Inventors find collaborators in the Center for Environmental Engineering (George Korfiatis and Christos Christodoulatos)
- Inventors need to acquire market intelligence
- Engage EMTM Students from Gary Lynn to perform Market Opportunity Analysis
- Negotiated License Agreement with Stevens Institute
- University provides Incubator Space
The PlasmaSol Team

- **Students**
  - Kurt Kovach – Eventually becomes CEO
  - Jack Levitt -- Eventually becomes CFO
  - Seth Tropper- Eventually becomes COO
  - Richard Crowe -- CTO
- **Scientists/Entrepreneurs**
  - Christos Christodoulatos
  - George Korfiatis
  - Erich Kunhardt
  - Evo Gallimberti
- **Team Members Receive 6.25% Share**

What Are the Target Markets?
How Big is the Addressable Market?

- Combustion Engine Market: $3.5B annually
- VOC Remediation: $1.4B annually
- Surface Cleaning: >$1B annually
- Industrial Stacks: $700M annually
- Sterilization of Medical Implants: Market Size?
Sources of Funding

• The Team
  – Each founder puts up $4,000

• Government Grants
  – National Aeronautics and Space Administration
  – Memorial Institute for the Prevention of Terrorism
  – DARPA
  – Environmental Protection Agency
  – National Science Foundation
  – Office of Naval Research

• Angel Investor
  – Wilt Hawkins invests $1M

• Venture Capital – why never obtained?

Funding is a Mixed Blessing

• Government Grants lead the research in divergent directions.
• Market Direction recommended by Business Leaders conflicts with funders Priorities.
• Angel Investor is disappointed.
• Company flounders for lack of single direction.
The Team Struggles and Recovers

- Students Kurt Kovach and Jack Levitt leave the company
- Investors insist on adding professional management
- Company hires Frank Shinneman as President and CEO
- Company also acquires industry expertise in Medical Instruments in 2004: Mike Orrico

At Time of Sale (2005)

- Stage: Development, Pre-Revenue
- Technology: Sterilization for Medical Instruments and Air
- Employees: 8
- Funding: $1+M/yr. Gov’t Contract
- IP: 4 US Patents +14 US Applications
- Sale Price: $17M
Key Lessons

DE-RISKING THE TECHNOLOGY: Where did PlasmaSol receive financial backing? What are the benefits and drawbacks of relying on government agencies as a source of funds?

MARKETS: What were the initial markets that the PlasmaSol founders pursued? How did they narrow down their market scope to medical sterilization?

TEAM: How did the PlasmaSol founders recruit the entrepreneurial team? Did they have the right mix of skills to commercialize the technology? How did team dynamics evolve along the way?

SUPPORT FROM THE UNIVERSITY: What did the university do to support the startup venture? What else could have been done?

Where did PlasmaSol get financial backing?

1. Founders
2. Friends and Family
3. Angel Investors
4. Venture Capitalists
5. Government
What were the initial markets that the PlasmaSol founders pursued?

1. Combustion Engine
2. VOC Remediation
3. Surface Cleaning
4. Industrial Stacks
5. Sterilization of Medical Implants

What was the biggest market opportunity for PlasmaSol

1. Combustion Engine
2. VOC Remediation
3. Surface Cleaning
4. Industrial Stacks
5. Sterilization of Medical Implants
What expertise was most lacking on the PlasmaSol team?

1. Basic Science
2. Engineering
3. Business
4. Industry experience
5. Management skill

Questions or Comments?
Institutionalization of AE

- University mission must include academic entrepreneurship
- Need to redefine faculty responsibilities – must reflect the changes that occurred at Stevens and other universities over the last 20 years and develop policies and programs that encourage and support innovation and entrepreneurship.
- Create proper administrative and faculty support structures that advance IP exploitation and commercialization
- Develop a rewards and incentives structure to attract faculty participation and recognition. The Promotion and Tenure process must recognize and reward entrepreneurial faculty, that perform high quality, broad impact research
- Integrate innovation and entrepreneurship education and training into ALL undergraduate science and engineering programs

The shift from a traditional academic culture to the entrepreneurial university can only be achieved by the Institutionalization of entrepreneurship

Stevens Technogenesis® companies

Research conducted at CES in the areas of cold plasmas and drinking water resulted in the creation of patented technology that was commercialized by two Stevens companies

- PlasmaSol Corporation
  - Air decontamination
  - Surface sterilization
  - Acquired by Stryker Corp. for $17M

- HydroGlobe® [http://www.hydroglobe.com](http://www.hydroglobe.com)
  - Drinking water treatment (Arsenic, lead, DU others)
  - Heavy metal remediation
  - Acquired by Graver Technologies for $5M

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