



## ThermoDynamic Films, LLC

**Company Overview:** ThermoDynamic Films, LLC (TDF) is a technology startup that is developing innovative solutions to thermal management problems. In particular, TDF has created FLOW fins that can remove heat from compact electronics more efficiently and economically than current technologies.

**Problem:** The inexorable trend in consumer electronics toward greater performance in smaller spaces has created an urgent need for improved heat removal. This requirement is already present in desktop and laptop computers and will become more critical in tablet computers, smart phones and high-power LED lighting. Inadequate thermal management will impact both performance and lifetimes of the devices. Current solutions, which use forced-air convection, are too bulky, expensive and noisy.

**Solution:** FLOW fins are economical, efficient, solid-state devices that generate airflows to enhance heat removal from electronic devices. FLOW fins are ideal for compact commercial devices such as computers and LED lighting since they eliminate the need for bulky, noisy and power consuming fans.

**Business Model:** TDF will build functional prototype FLOW fins and will then contract with established electronics manufacturing service providers or established thermal management companies to manufacture our products.

**Market Opportunity:** The first market for FLOW fins is to replace fan-sink units in desktop and large laptop computers. The attractiveness of this market (about \$70 million in 2011) is its low barrier to adoption. FLOW fins can be designed as "drop in replacements" that require no additional engineering while providing better performance at lower cost and power. After a successful incursion in the fan-sink market, FLOW fins will make inroads into the larger market for replacing stand alone fans (about \$1 billion currently) and the high-power LED market (expected to be \$2 billion by 2020).

**Competitive Advantage:** FLOW fins have four important advantages over approaches that use fans together with heat sinks: FLOW fins are less expensive, more compact, quieter and use less electrical power.

**Management Team:** The CEO Dr. Richard Epstein and CTO Professor Kevin Malloy are co-inventors of TDF's key technologies. Dr. Epstein was a fellow at Los Alamos National Laboratory (LANL) and Professor Malloy was recently associate dean for research in engineering at the University of New Mexico (UNM). They have each initiated and led large technical projects at LANL and at UNM, respectively. Additionally, Professor Malloy was a co founder of Zia Laser, Inc., which was sold in 2006 and is now called Innolume GmbH. TDF's operations manager, Stefi Weisburd, has a graduate degree in applied physics from Stanford and is a published poet and science writer.

**Funding Request:** TDF is seeking \$1.5 million to build functional prototype FLOW fins that can be used for reliability testing and as models for large-scale production.



**RICHARD EPSTEIN**

*Investors: Founders*  
*Year Founded: 2010*

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*In Attendance:  
Dr. Richard Epstein, CEO*

**Revenue Forecast:**

2012:	\$ 0.4M
2013:	\$ 0.6M
2014:	\$ 0.2 M
2015:	\$ 20M
2016:	\$ 80M