Olin team was not yet versant with computer-aided design (CAD) software, Jim saw that as an opportunity:

> *These guys were doing engineering diagrams on paper with pens and pencils—but now we were going to need professional stuff. I said that we could all learn CAD together, and if they made mistakes, great, that's fine; we'd work through it.*

Concurrent to this effort was the task of crunching the numbers to design a machine that would work as promised. As they began to source out the internal components, they searched for a design, fabrication, and manufacturing subcontractor that could produce the steel cabinet on a tight schedule. Although the team had explained that SPC would be overseeing the entire process from design to assembly, quotes for the first box still ranged from $80,000 to $400,000. Jim noted that SPC had an even bigger problem to deal with:

> *On top of the price, the lead times that they were giving me were not going to cut it; I had to get this thing to Colorado for the ski season!*
>
> *So, we decided to build it ourselves. I went to a local fabricator trade show, and discovered that although they all have internal engineering groups, some were willing to take a loss on the research and development side in order to get the manufacturing contract.*
>
> *We chose Boston Engineering since they are very interested in developing a relationship with Olin engineers. They gave me a hard quote of $2,400 for the engineering assistance and $2,400 for the cabinet. By this time, we had sourced all the components we needed, and we began working with their engineer to size everything up. Bob Treiber, the president, was great. He made us do the work ourselves out at his facility in Hudson (Massachusetts), but he also mentored us, and his firm did a ton of work pro bono.*

Fulfillment and Feedback

As the Christmas season deadline came and went, the days grew longer. By late January 2004, Jim was working through both of the shifts they had set up: from four in the morning to nearly eleven at night. In February, they fired up the device, tested it for three hours, and shipped it off to Colorado (see Exhibit 3.2). Jim met the device at their shipping dock, helped unwrap it, met the staff, and put a few finishing touches on the machine. Although it worked, even at zero degree temperatures, it had never been tested in the field. Jim left after a few days, and for two weeks, he endured a deafening silence.

Jim wrestled with how he could check in with SPC's first customer without betraying his acute inventor's angst about whether the machine was still working, and if it was, what Vail thought about it. Finally, when he could stand it no longer, he placed the call under the guise of soliciting satisfied-customer feedback. The news from Vail nearly stopped his heart:

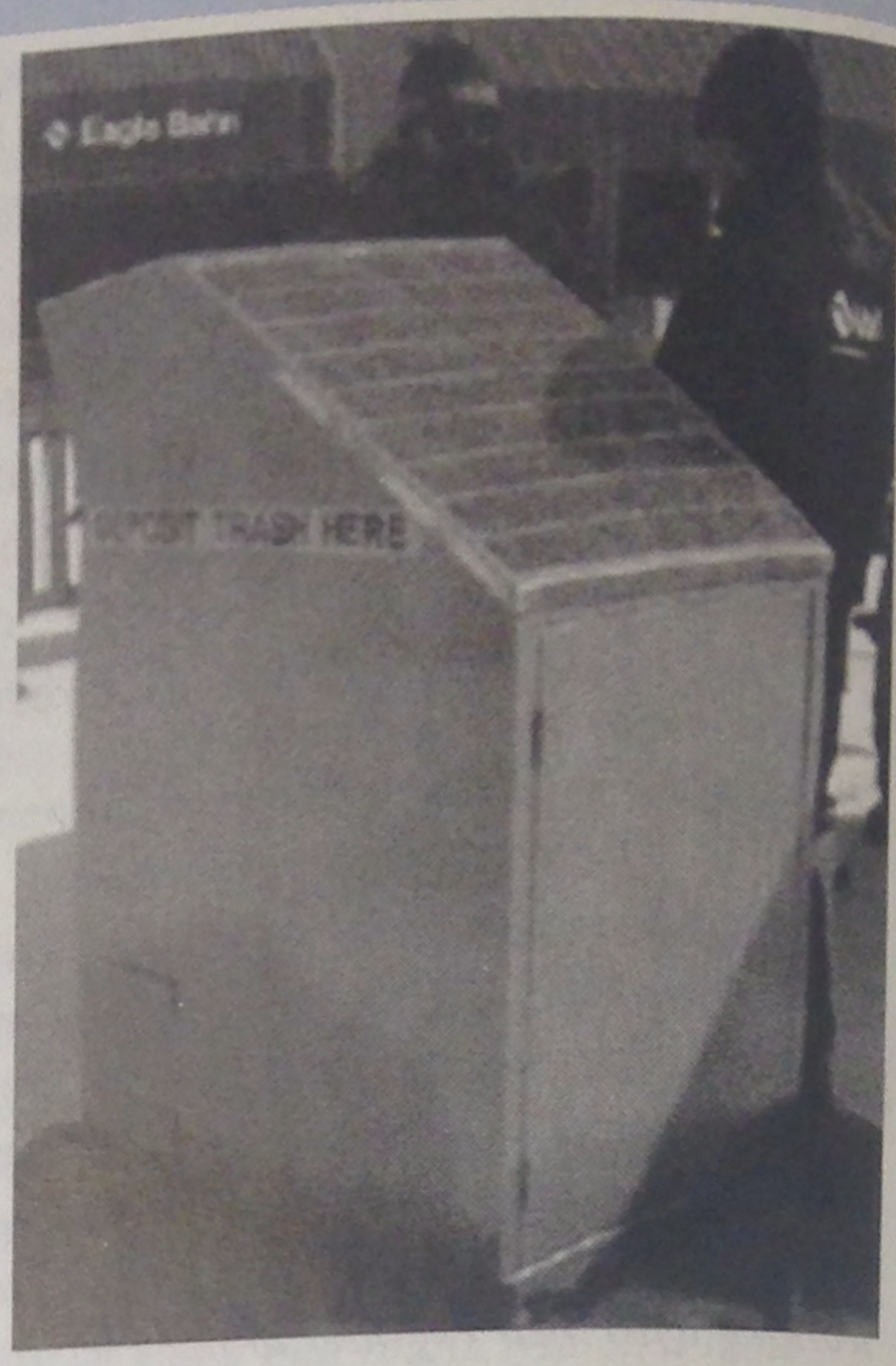
> *They said that they had dropped the machine off a forklift and it fell on its face. Oh man, I thought; if it had fallen on its back, that would have been okay, but this was bad—real bad. And then Luke tells me that it was a bit scratched—but it worked fine. He told me how happy they were that we had made it so robust. When I asked how heavy the bags were that they were pulling out of the thing, he said, "I don't know; we haven't emptied it yet." I was astounded.*

As it turned out, the Vail crew discovered that the single collection bag was indeed too heavy—a two-bin system would be more user-friendly. The resort also suggested that the inside cart be on wheels, that the access door be in the back, and that there be some sort of wireless notification when the compactor was full.

EXHIBIT 3.2 The BigBelly Arrives in Vail

a.

b.



As the SPC team got to work incorporating these ideas into their next generation of "SunPack" compactors, they were also engineering a second product that they hoped would expand their market reach to include manufacturers of standard compaction dumpsters. The "SunPack Hippo" would be a solar generator designed to replace the 220-volt AC-power units that were used to run industrial compactors. The waste-hauling industry had estimated that among commercial customers that would benefit from compaction, between 5% and 20% were dissuaded from adopting such systems because of the setup cost of electrical wiring. SPC planned to market the system through manufacturing and/or distribution partnerships.

Protecting the Property

While the interstate shipment of the BigBelly had given SPC a legal claim to the name and the technology, Jim made sure to keep his able patent attorneys apprised of new developments and modifications. SPC had applied for a provisional patent in June 2003, and it had one year to broaden and strengthen those protections prior to the formal filing. As that date approached, the attorneys worked to craft a document that protected the inventors from infringement, without being so broad that it could be successfully challenged in court.

The SPC patents covered as many aspects of Sun Pack products as possible, including energy storage, battery charging, energy-draw cycle time, sensor controls, and wireless communication. The filling also specified other off-grid power sources for trash compaction, such as foot pedals, windmills, and waterwheels.

Even without these intellectual property protections, though, Jim felt that they had a good head start in an industry segment that SPC had created. Now they had to prove the business model.

The Next Generation

While the first machine had cost far more to build than the selling price, the unit had proven the concept and had been a conduit for useful feedback. A production run of 20 machines, however, would have to demonstrate that the business opportunity was as robust as the prototype appeared to be. That would mean cutting the cost of materials by more than 75% to around $2,500 per unit. SPC estimated that although the delivered price of $5,000 was far more expensive than the cost of a traditional trash receptacle, the system could pay for itself by trimming the ongoing cost of collection (see Exhibit 3.3).

EXHIBIT 3.3 Customer Economics