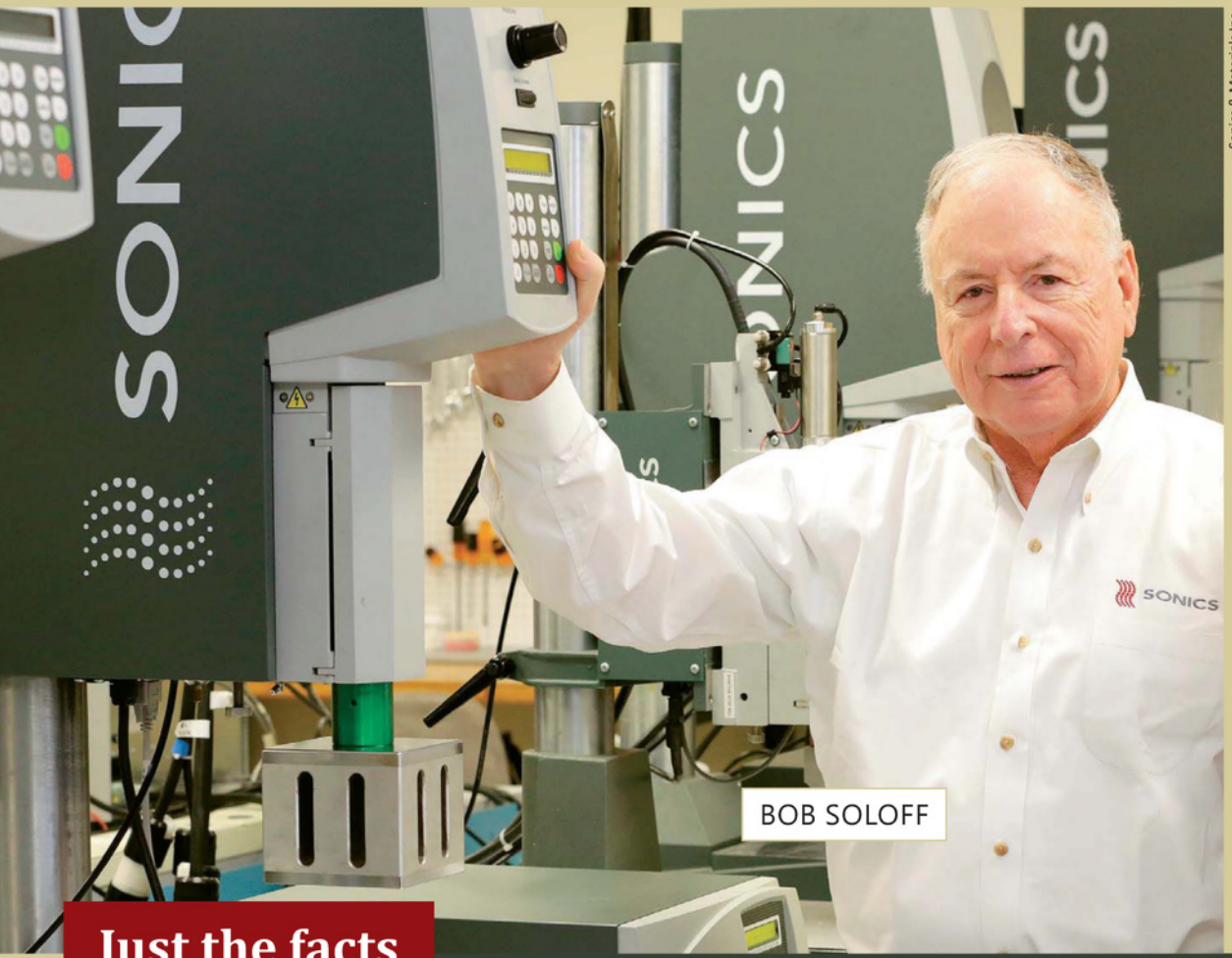
Father of ultrasonic welding



Sonics & Materials Inc.

Just the facts

WHO IS HE: Bob Soloff, founder of Sonics & Materials Inc.

HEADQUARTERS: Newtown, Conn.

EMPLOYEES: 75

PATENTS: Sonic Method of Welding Thermoplastic Parts in 1965, plus 30 others in his company's name.

EDUCATION: Bachelor of Science in mechanical engineering, The Cooper Union for the Advancement of Science and Art, New York

A mechanical engineer by trade, Bob Soloff began creating his legacy in the plastics industry with his accidental invention of ultrasonic welding. Since the filing of that first patent, Soloff has patented numerous related tools and components and run a successful business, in which his daughter now also plays a significant part. He recently spoke with *Plastics Machinery Magazine* correspondent Lisa Jo Lupo.

Your invention of ultrasonic welding has been significant for the plastics industry. Can you tell us the story of the discovery?

Soloff: As unbelievable as it seems, it was one of those "aha moments." I was playing around with ultrasonics for different applications, so I was at my desk with an ultrasonic probe in my hand when I accidentally touched the probe to a Scotch tape dispenser. Lo and behold, the two halves welded together! That's when I had the "aha moment" that maybe it would work with other plastics, too.

So, I went out and bought a bunch of plastic toys from Woolworth's. They were already glued together — that was the primary method of assembly at that time. I cut the toys apart, then applied the probe to the toys. The vibrations welded them together.

How did you bring your invention to market?

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Soloff: After playing around for a while, I thought, maybe there is a real use for this. So, I went to the Yellow Pages and looked up "toys." There was a company at that time called the Ideal Toy Co.; it was one of the biggest in the country. I called them. I got through to a number of people — they were all very nice — telling them, "I'm able to weld plastics using ultrasonics." I finally talked with an executive who said, "Why don't you come down and show us what you can do." They were in Queens in New York City, so I drove down. When I got there, he brought out some toys they were manufacturing. The first thing he gave me was a small Roy Rogers stagecoach. I touched the roof with the ultrasonic probe and welded it to the body of the stagecoach. He said, "Boy, we could use this!" So he asked if I could leave it there and what it would cost. I had no idea what I should charge at that point!

But I left it, and he called me back, asking if I could come demonstrate it again for other people to see. I went back down, and they had a whole box of plastic toys. We were having a great time welding those toys! They gave me some recommendations, like adding a timer and pneumatic press, and asked me to make it into a machine they could use in production. So, I did, mounting it on a drill press stand and adding a timer and pneumatic cylinder. And that became the first ultrasonic welding machine.

I kept calling on people and, in 1964, I wrote an article for *Modern Plastics* magazine. It was the first article ever written on ultrasonic welding and it drew several thousand inquiries. So, I put a machine in my station wagon and drove across the country, to California and back. That's how it got off the ground.

In my time, I think I must have visited more than 1,000 customers — selling our equipment to everything from computer companies to toy companies. They have totally different technologies, but one thing they all have in common is the need to assemble plastics. Every possible industry uses plastic, and every industry needs to put plastic together. My experiences exposed me to many industries, which helped in providing solutions for the various problems that needed to be overcome.

When did you patent your invention and what do you see as its greatest benefits?

Soloff: I invented ultrasonic welding, as we know it, in 1963; the patent was filed in 1965. But when I first described to the patent office what the equipment could do, they said, "We don't believe you can do that." So, I drove the equipment to the patent office in Washington, D.C., and demonstrated it to the examiner. The patent was then issued in about a month — I think it set a record time.

Prior to that, the only options for bonding plastics were glue or heat, but glues are noxious and heat takes a long time and uses a lot of energy. Ultrasonics takes maybe a couple seconds or even fractions of a second. With ultrasonics, you also can weld together two parts of different shapes; you squeeze them together, hold the ultrasonic probe to it, and the vibrations travel all around the periphery to weld them together. So, it has many advantages for welding materials.

Sonics & Materials Inc. photos

Bob Soloff with an ultrasonic welding press, circa 1960s. Inset: Soloff's daughter, Lauren Soloff, Sonics executive VP

I kept making that machine for about three years. Now it is more sophisticated, but, even today, the basic functions are still those of that machine.

So, the first use was for welding of rigid injection molded plastic, but another application came up that is very important today — using it to stake over plastic bosses to hold materials together. This is one of the most important applications in the automotive industry today.

I've also filed other patents for different tools for using the probe to do particular applications.

(*Editor's note*: Examples include Solid Acoustic Horn with Suction Means, Tuning Mechanism and Method for Vibration Welding, System and Method for Ultrasonic Assisted EDM Machining, and a System to Prevent Overloads for Ultrasonic Staking.)

How did you turn your invention into a thriving business?

Soloff: I founded Sonics & Materials in 1969 because our feeling was we could make a better mousetrap. So, I put the company together with a few people and started selling equipment. We were offering features other companies weren't. For example, other companies were offering machines made out of sheet metal. Our machine was more rigid, made with metal castings, which was unique at that time.

Part of the ultrasonic unit is commonly called a horn; we starting making designs that were very unique that weren't done previously with ultrasonics, so that opened some doors. Then we started doing some marketing and began using distributors — which took us international. We sell overseas, with Asia and China as big parts of our market, through what is now about 50 distributors.

About 20 years ago, my daughter, Lauren, came on board. She is very active in the business and has been a big help over the years; in fact, we've tripled our sales in the time since she joined. We also manufacture ultrasonic products for biotechnology and life science applications, so even when one industry sector was going through tough times, we kept growing and were always profitable.

To what would you attribute your business success?

Soloff: I think our reputation enabled us to bring in the business. Over the years, we've also hired really great people with technical education and/or hands-on knowledge.

To get people really involved in the business, we have a quarterly profit-sharing plan, giving 10 percent of pretax profits to our employees. We are a private company, and every quarter, I make a presentation on the company to the employees as if I were giving an annual report to stockholders. I then personally hand each employee a profit-sharing check.

We also involve employees through scientific collaboration and creativity. We do many interesting applications which really provide a challenge to their technical abilities to solve customer problems.

How would you like to be remembered? What do you see as your legacy?

Soloff: I'd like to be remembered as a pioneer in the ultrasonics industry, to be remembered as the father of ultrasonic plastic welding. I've created and nurtured an environment of innovation at Sonics. Introducing new young minds to the unique intricacies of ultrasonic technology, I like to foster a spirit of scientific collaboration that inspires more new discoveries, while expanding the knowledge base of many young engineers.

Today, Sonics remains a family-run business. The company has grown considerably over the past 48 years, but I'm happy to say that it still operates with the personal, friendly atmosphere of a family business. I walk the floor daily and know every employee, which is part of the reason there is great employee retention, with many employees being with the company for a long time, over 20 to 40 years.

Certainly, I hope an important part of my legacy will be the ongoing success of Sonics and its employees, as together they continue to innovate and move the company, and the industry, forward.