

How do we become Metal Casting Missionaries?

The story of the FEF Foundry in a Box Project

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FEF strengthens the Metal Casting industry by supporting unique partnerships among students, educators and industry, helping today's students become tomorrow's leaders.

After WWII ended, there was a desperate need for skilled technicians and educated leaders in the U.S. Metal Casting industry. The Foundry Educational Foundation (FEF) was established in 1947 by the leaders of the Metal Casting industry, with the support of affiliated organizations and societies, as an independent method of promoting Metal Casting educational programs at colleges and universities across the country. The primary goal was to bring top-quality men and women into our industry. FEF has since become the Lifeline of quality people to the Metal Casting industry throughout all of North America.

FEF continues to supply the industry with enthusiastic, technical and management-oriented people. Over 70% of all FEF scholarship recipients have reported full-time employment in Metal Casting as their first job after graduation. Industry and government sponsored research at FEF schools has become the core of important developments in the Metal Casting industry. Indeed, most of the significant Metal Casting technology transfers since WWII were likely to have been accomplished by FEF graduates.

Another of the goals of the FEF has been, *"To strengthen the image of FEF among educational institutions, government, professional societies, customers and supporters."* In an effort to fulfill this lofty goal, FEF has been considering ways to get Metal Casting presented to students as early as possible during their formal education. Since most young people, and probably most older people, have no clear idea what Metal Casting is, we thought that it would be a good idea to develop a very simple, safe and clean method of demonstrating the Molding, Melting, Pouring and Finishing of a small casting.

Three young women at Tri-State University in Angola, IN, decided to take on the challenge of developing such an educational unit as their Senior Project in 2005. Brianna Clemens, Stephanie Vogelpohl and Project Manager Sarah Weigle worked closely with their University Advisor, Dr. Forrest Flocker, and their Industrial Advisor, Tom Cobett, of OmniSource Corporation. Their project was well received by their peers, their professors and the industry. The prototype unit was immediately adapted for use at the ASM International Materials Camps.

An important side note to this story is that all three of these young women entered different facets of the Metal Casting industry upon graduation from Tri-State!

A team of students at Kent State University, under the leadership of FEF Key Professor Mike Dragomier, took up the challenge to improve the original concept by condensing everything into easily portable shipping boxes. The AFS Student Chapter at Kent State

continues to manufacture many of the components of the Foundry in a Box, including the molding sand, flasks and matchplate patterns. Kent State and FEF alumni Trent True (Harrison Steel Castings, Attica, IN) and Ben Hunsicker (OmniSource, Ft. Wayne, IN) have been instrumental in further down-sizing the Foundry in a Box into just one box full of materials and equipment that can be used anywhere by nearly anyone.

The FEF Foundry in a Box allows students and teachers to utilize a non-toxic, oil-based molding sand to make a small matchplate mold. The K-BOND molding sand was largely developed by another FEF Alumnus, Jolene Miller Morello, at Kent State University, to replace smoke-generating, foul-smelling and toxic molding sands that contained standard motor oil. The K-BOND sand molds for the Foundry in a Box have no smoke, no odor and no toxicity.

The first few matchplate patterns we made had a simple FEF, AFS, ASM or CFA logo on them. Frankly, the kids weren't too excited about having a casting with a few letters on it. We have since developed matchplate patterns with replica Indian arrowheads and small starfish on them. Now we have students standing in line to make a Tin casting!

The metal for the casting is pure Tin. This was chosen because of its low melting point (about 450°F), because of its lack of any toxicity and because it has a silvery luster as a casting. The melting is actually achieved in a modified microwave oven. Using molecular nano-heating technology, developed by some of the country's leading ceramic researchers, a specially designed susceptor crucible attracts the microwaves, rapidly heats up, and then melts the Tin metal inside of the crucible. Once the crucible is hot, it behaves the same as a crock pot. Anything that you put into it will get hot.

The microwave appliance we use starts out as a standard kitchen unit. Additional cooling of the magnetron and electronic circuits is accomplished by incorporating a recirculating liquid cooling system. The standard rotating glass plate is replaced with a piece of high temperature refractory board. Foundry in a Box team member, Ben Hunsicker, makes all of these necessary improvements in his home workshop.

In its simplest form of **All-in-one-Box**, the Foundry in a Box can be purchased from the FEF for a bargain price of \$1500.00. This allows for the demonstration of melting Tin in a microwave oven and pouring it into a sand mold made from a matchplate pattern.

Other configurations of the Foundry in a Box Include:

Basic Set of two Boxes - (Resistance Electric Melting, Sand and Permanent Mold) - allows for the demonstration of melting Tin in a resistance electric furnace and pouring it into a sand mold or a graphite permanent mold
\$3750 per set of two boxes

Microwave Melting Box - (with 2 MicroMelter crucibles, tongs, refractory plate and liquid cooling)
\$1250 per box

Group Sand Molding Experience Box - (12 Flasks and Matchplate Patterns)
\$1000 per box

In the past year, volunteers including FEF Key Professors and board members have utilized the Foundry in a Box at events including ASM International “Materials Camps” for interested high school students and “Teacher’s Camps” for teachers interested in offering more Materials Science experiences to their students. We have also done presentations for American Foundry Society, Canadian Foundry Association and other technical association chapter meetings. Some individual High Schools have asked us to come and spend a day with their students. AFS and CFA Chapters have actually purchased a Foundry in a Box unit for use in their local area schools. We have even toyed with the idea of demonstrating Metal Casting at the mall on a Saturday afternoon!

Nearly all of the students that have seen the microwave melting have remarked that, *“You shouldn’t put metal into a microwave oven!”* When questioned about who told them not to put metal into a microwave, the majority of the students indicated that the directive came from their mother. On one occasion, we asked a young girl if her mother was a Metallurgist and she emphatically replied. *“Yes, my mother IS a Metallurgist!”* That night, we are sure that the young girl went home to teach her mother something new about melting metal with microwave energy.

How will we know if we have been successful with the Foundry in a Box Project?

One thing we know for sure is that if we do not educate our young people on the importance of the Metal Casting industry, then, there will certainly be fewer of them choosing Metal Casting as the place for them to start a career. There will certainly be more people who do not want Metal Casting plants in their communities. There will certainly be more government leaders saying that Metal Casting is a dirty and dying industry.

It’s a bit like doing missionary work for your church. Does all of the missionary effort, done on behalf of our churches, do any good? It certainly doesn’t hurt. With some luck, it may just enhance the quality of many people’s lives.

For many of us in the Metal Casting industry, we can cite the name of one or two older people who directly influenced us in our choice for a career. They helped us at a critical time in our lives and now it is time for us to help other young people. Somebody has to pick up the challenge to be a Metal Casting Missionary. We hope that the FEF Foundry in a Box equipment will help these industrial missionaries be successful in their quest, and allow them to have some fun along the way.

If all we accomplish is to enlighten a few young kids about how foundries are important to our economy and to show them that making castings does not have to be hot, dirty and dangerous, we will have been extremely successful.

For further information on the Foundry in a Box equipment, or to volunteer some of your time for the project, contact the FEF Executive Director Bill Sorensen at bill@fefoffice.org or FEF Education Committee Chairman Tom Cobett at tcobett@omnisource.com.