The Rapid Solidification Process (RSP)

History

The Rapid Solidification Process (RSP) was developed at the Idaho National Engineering and Environmental Laboratory (INEEL) under grants from the U.S. Department of Energy. The initial patent for the process was written in 1990 and had as its basis the invention or discovery that a liquid could be broken down into small droplets by use of the shearing effect of a flowing gas.

Work on the process resulted in another patent in 1995 which introduced the use of pressurized injection of liquid into a Ventura tube, thereby improving the operational flexibility of the device while producing a more uniform droplet size distribution in the spray. An additional benefit was the ability to control and increase the cooling rate of the droplets, which results in microstructure and material property improvements in the deposited metal. This resulted in two things: a new patent in 1997, and the terminology of RSP Tooling. Additional patent applications have been submitted which refine the actual process to produce tooling.

RSP Tooling, LLC was formed in January 2002 to design, build, use and sell machines that manufacture tooling using this process. The company signed a license agreement with Bechtel BWXT Idaho, LLC (the company managing INEEL) for the exclusive worldwide use of the RSP patents for all tooling applications. The first production machine was designed and built by Belcan Corporation's Specialty Equipment Engineering Division (SEED) of Solon, Ohio. This machine (see Figure 1) is able to produce a 50-pound steel insert (7 inches x 7 inches x 4 inches) every three hours. It is designed as a single batch unit so that a different metal can be used for each insert. The spray process is able to spray steel at a rate of about 500 pounds per hour. The machine is located at The Technology House also located in Solon, Ohio and is now producing tools for various industries including forging, die casting, stamping and plastics injection molding.
Figure 1. RSP Tooling beta machine

Figure 3. RSP H13 at 500x.