

ARCH1855 Write-Up

Experimental Smelt

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My shift at the experimental smelt was on the morning of Saturday, April 23, the day of the smelt. When I arrived in the morning, after setting up the smelting site by fabricating a lean-to and other covers to help protect against that day's rain, we got started by crushing the charcoal into pieces small enough for use in the fire. We hauled over eight bags of commercial charcoal, and the charcoal pieces contained inside were very large, often up to several inches long. To rectify this, we poured the charcoal over a metal grate with gaps of about one or two inches, and pounded the charcoal with wooden mallets to force it to break up and fall through in smaller pieces. Below the top grate, another wire grate with even smaller holes, probably on the order of a few millimeters on a side, caught the pieces of usable charcoal, and filtered out the other flakes, referred to as fines. After all the charcoal was broken down filtered in this way, we shoveled it back into the sacks it came in for use later on in the smelt.

Participating in this charcoal crushing process really made clear to me the many physical elements involved in the preparation of charcoal. The air was thick with charcoal dust (we wore dust masks to protect ourselves), and the heavy rhythmic noise of the wooden mallets on the grate was also a fixture during the entire process. It began to make some of the different smelting traditions we have examined around the world make more sense to me, because the full sensory experience of crushing the charcoal gave me a physical understanding of the charcoal preparation process that I have not quite fully obtained from the reading material.

While I worked on the charcoal, the fire in the smelting furnace was started up and the furnace began running. Soon after, the furnace had been loaded with charcoal, and afterwards it was topped off with charcoal periodically as the fuel burned. Ore was not added early on in the smelt. My task during this part of the smelt was to take readings with the thermocouple of the temperature in the furnace at six points, roughly spaced evenly, down the side of the furnace. Readings taken in such a way were able to give us a good idea of the temperature conditions in the furnace. This was a slightly challenging task, because while it took a little while for the reading on the thermocouple to settle at a final value, the thermocouple ideally should be in the furnace for as short a time as possible, because the wires certainly would melt off while it was inside the furnace. The wires, upon being pulled out of the furnace, would almost always be glowing red hot. I was impressed and surprised to see temperature readings between 1200 and 1300 degrees Celsius, very high temperatures to come from our smelting furnace. Although problems with the thermocouple prohibited me from taking very many readings at different times, I was able to obtain a few sets of readings, from which we can perhaps approximate the thermal gradient in the furnace very early on in the smelt.

Overall, the smelt gave me a good physical understanding of the reality of the complexity and intensity of the process of iron smelting. The process is indeed a complicated one (and subject to the mercy of the elements, as we found out in the rain on Saturday) and I appreciated the experience

of having been a part of it.