Homemade coffee roaster instructions

There's a lot of mysticism around roasting coffee, but in the end it couldn't be easier. Take a bunch of beans, warm them up evenly, and stop before they are burned. The rest is the details. The same goes for coffee roasters. The most primitive method of roasting involves stirring the beans into a pan or wok to keep them from scorching at the bottom. It works great, but doesn't scale. Industrial drum roasters heat the rotating drum with ridges inside like a cement mixer to keep the beans in constant motion while they pass through the gas fire. Liquid roasters use a strong stream of heated air to circle the beans around, roasting them evenly. But the bottom line is that the coffee roaster should agitate the beans for a controlled heat source, so that they roast as evenly as possible. My DIY coffee roaster gave up the ghost a few days ago and I immediately ordered a substantial part of the replacement, hot air popcorn popper, to prevent a real crisis: no coffee! While I was recovering, I thought I'd take some photos and share what I know about the subject. So if you're interested in roasting coffee that makes popcorn popper in a roaster, or even just taking an inside look at the carefully cost-engineered kitchen machine, read on! Roasting coffee hot air popcorn popper, according to the rough definition of the above, liquid bed (popcorn) roaster. Indeed, with very minor changes to beat the temperature-limiting thermostat, stock popcorn popper makes a good homemade roaster. And once you've done this simple modification, described below, the protocol can be very simple: go outside with a roaster and some green beans and turn it on. Add the beans until they just stop swirling around at the bottom and then pull out a few so that they swirl slowly again. Relax, look and smell, but first of all, listen. As the beans heat up past the boiling point of the water, they will begin to turn the cinnamon brown and make a sound like popping popcorn, exactly for the same reason: steam the crackling beans open. This stage is called the first crack in roasting jargon, and depending on how many beans you have, it can be loud. Beans will also start to throw with their skin, chaff, in the air and steam will start to smell good rather than just beany. You will know when you hit the first crack. (You'll also understand why you do it outdoors.) After that, there is a quiet spell as the beans continue to heat up and darken in color as they are caramelized. Around the end of the roast, they will start to make a significantly quieter clicking noise called a second crack. This fiber matrix is in bean breaking down and you will see tiny little round chips flying from the beans, and maybe even starting to see smoke. Here, beans have coating of the oil that came out came out Surface. I tend to stop only at the first sign of a second crack, for espresso, but there are those who like it darker. Turn off the popper and toss the beans into the colander to cool. Your first home roast coffee experience will be revolutionary, and the finer details about how dark roasts are, how fast, and even what coffee mix together pale compared to the difference that a fresh roast makes. A friend convinced me to try this around the end of the last century and I've been stinging my own beans ever since. Indeed, I roasted with a $3.99 thrift shop machine for a few years before I finally got the urge to take further control and refine the roast. From Popper to Roosters there are only two variables to control with popcorn poppered bed roaster: excitement and thermal input. This means controlling the engine fan and heater coil, both of which are very scoundrel on the PWM through solid state relays and muscular MOSFETs, respectively. If you're going to automate the roast, you'll also want the temperature probe dipped deep into the swirling mass of beans to use for feedback. As you can see, even going all over the pigs is not that difficult. The fan engine is a 20-24 V DC engine, and the heater coil is actually two coils run in a series that are designed to run off the voltage network. One of the smartest bits of engineering value is the use of coils that are just resistors after all, like separating the voltage before fixing the AC in D.C. for the engine. The old roaster had a bimetallic strip all poppers I saw also had a thermostat that turns off the heater coil at the right temperature for popping corn, which is unfortunately just a little too cool for roasting coffee. The thermostat will need to be bypassed or removed. The thermostat will be a simple bimetallic strip, either attached to a heater or a burnt cylinder. In the latter case, simply cut the wires and throw away the thermostat. If it is attached to the heater element, you can defeat the bimetallic strips by bending it hard enough, so that it always makes contact regardless of temperature. There is also a heat fuse that prevents the device from catching beans on fire in case the engine fails to push the air over the hot coils. In my experience, this fuse would blow sometime, so you might as well short it now with a muscular strip of copper wire. If you decide to defeat the heat fuse, I think my dirty hack, visible here, has enough explanation. This wire should be 9d or simply tightly wrapped. Don't use solder - it's getting hot here. If you don't want to automate your roaster, you're done and you can screw it back together. Note that this that now you are responsible for ensuring that the fan is on whenever the heater is on. If you're setting a temperature probe like me, it doesn't really matter. But if you're running a popper without You can do it on a fireproof surface under strict control - we defeat the fire safety mechanism after all. If you want to automate things, you have some wire cutting and a bit of desoldering to do. You don't need a voltage divider if you're going to drive the engine outwardly, so you can just cut off one of the three wires that lead to the heater elements. I usually only use basic coils, which means connecting to the wires before the heat fuse and right after the thermostat. Here in Europe, one reel reads 40 ohms while another reads 10 ohms; Use one with great resistance. Engine solder on the straightener board that you can desolder completely. THE DC is usually electrically noisy, arcs like brushes make and break pins, so I often toss a couple of capacitors from the terminals to the engine case to damp it down. And since I'm going to control the speed with PWM, it's a good idea to add freewheeling diodes through the terminals. The disconnection and freewheeling heater element in its natural engine condition and heater are ready to assemble for the moment, you have a pair of wires leading directly to the heater coil, and a pair of wires leading directly to the dc engine. Connect THE MOSFET on the low side of the engine and the SSR for the heater. I added in the thermocomp and (since discontinued) THE SPI-speaking MAX6675 thermoamp and reference. You will need a thermal fries because the maximum temperature of the roast can be in the region of 250 degrees Celsius, which is too hot for other temperature sensors. From here, the rest of the assembly is an exercise in the microcontroller. The physical build and creature comfort of the roaster that I have used for nearly a decade is based on the design board that I built for the class in AVR programming that I gave. Why? Because it has four user buttons, some LEDs, and a serial port with a handy pinout. You could use Arduino or anything else you like. The buttons are mandatory to control the machine, however. I also hooked the potentiometer to the ADC pin which was useful during development. As you fine-tune your roast, you'll be happy to have as much real-time input as possible. Test-shooting on the bench to make 24 V DC for the engine, I bought a transformer from a surplus store, whipped up a full wave straightener of four diodes and buffering dc voltage with a very large capacitor (3300 yF) because it's a DC-like running engine and came down from a simple LM7805 to 5 V that the microcontroller needs. I got brownouts and odd resets with less smoothing. In the incarnation depicted, everything is simply attached to a piece of wood. I reused roaster as support engine and heater, just sawing it and screwing it. It was easier than building my own bracket exactly these specifications, but yes, it's this look better. You may also find that the beans fly out as they lose weight. I objected to this by extending the roasting chamber with the soup can. I'm venting the whole shebang out of the window with an aluminum tail dryer exhaust hose because I love to fry coffee in winter too. Data on the progress of the roast are repeated from the serial line, and are reflected in the LEDs. The microcontroller also responds to simple commands sent during the serial in addition to the buttons. I used this for debugging a long time ago, but it also turns out trivial to make a serial to mott bridge from the ESP8266 module. Now control and logging occur via WiFi - no longer standing in the bathroom with a laptop to enter the roast. I think if I sent the data to the cloud it would be a buzzword-compatible IoT roaster, but I would rather keep my data for myself. As it stands, I load some beans, put the exhaust out the window, walk to my laptop and type fried. The machine does the rest and code on laptop logs and graphics results. Fried profiles like Solder Profiles With full control over the roaster, you can really start geek over the intricacies of roasting. For example, my routine ramps up with a motor and heater at full to a measured 120 degrees Celsius and then keeps there on a bike heater for two minutes. Different beans will have different moisture content, and this gives them a chance to roughly equalize, similar to the pre-soaking phase of the re-flow oven. After these two minutes of soaking, the beans pass through the first crack on full heat and then smothered to 10 degrees Celsius/minute ramp to the desired final temperature. With my old popper/roaster, I needed to lower the air speed (in green) to even reach such a ramp, but the new popper has a stronger heater, and it seems that I will need a PWM heater in order not to exceed the target speed. Expect variability depending on your popper, but you can't go too far wrong with a simple dunk and profile ramp here. At the end of the roast heater is turned off, the fan is installed in full, and the beans are cooled. The exact temperature that signals the end of the roast determines how dark the coffee is, and is determined by trial and error and depends on your taste anyway. I roast darker or lighter depending on what beans are in the mix, and even whether they are designed for cappuccino or espresso - extra bitterness and lower sourness darker roast nicely with milk. You're going to play with different roasts anyway to get your coffee as you like it, so that's all you need here is reproducibility. Absolute temperature also largely depends on the location of the thermal coupe in the roaster. If he is completely immersed in the beans, he will read a little hotter than the temperature of the beans, but it will read differently depending on where it is. Is. Want to control a few roasts, note at what temperature the first and second cracks occur, and use them as a guide to automate your roast. With my new popper, and the corresponding new temperature probe geometry, I'm going to re-jigger my temperatures again, which means drinking a cup over a cup of increasingly delicious coffee. A hacker has a hard life. Anyway, this is my setting and its justification. With the ESP8266 module, a new $20 roaster, and misc electronic parts, I'd estimate the build cost would be just under $40 for WiFi connected, logging a coffee roaster that can hit almost any fried profile within reason. But as I said earlier, in the past I did do with the $3.99 used popper from the thrift store. The price of entering the world of coffee roasting is minimal, and the result is more than worth it. And if you can turn it into an unnecessary weekend project, so much the better! I certainly hope you do. Throw a line in the comments if you have any questions, or links to your roasters that you want to share with us. Us.