

# The Pickled Pig's UDS Build

## **Introduction**

Drum pits have been around a long time but they've really grown in popularity over the last couple of years. They are efficient, relatively economical and easy to make, and they produce good barbeque. Most drum owners are attracted to the design flexibility and low cost for those with scavenging, creativity, and mechanical skills. Many drum cookers have been made for as little as \$10.

Our motivation for making these drum cookers was that we perceive a competitive advantage in using them. In competition, some of the most successful BBQ cooks in the country are using drums. Most drum cooker designs incorporate a direct heat cooking process where the juices from the meat drip on and are vaporized by the hot coals. We believe this adds a unique and sought after flavor that more traditional, indirect heat pits cannot duplicate.

As you read our process below, keep in mind that convenience was more of a factor to us than cost. We paid full retail for all of our parts and only used new components. With a little bit of scavenging effort, we probably could have shaved more than 50% off the cost. If you are going to build your own UDS, you can save a lot of money by being creative in your design and scrounging for parts.

There are a lot of different modifications and construction techniques that others have used with success. This is in no way meant to be a definitive "How To" guide, only a description of what we did.

## **Research and Design**

Virtually everything we learned about building an Ugly Drum Smoker can be found at the [BBQ Brethren forums](#). There are more than 160 pages of information and pictures in that thread and we suggest hunkering down with an adult beverage of your choice and reading it from start to finish in order to see what others have experienced.

We intentionally tried to keep it simple and use proven design concepts. Other than close observation of these units in action, we had no experience in the construction and use of a UDS. Our goal was to learn how to cook on and compete with these new cookers in a matter of weeks.

These were our design goals:

1. Needs to hold steady cooking temperatures from 200-400F w/ minimal effort
2. Needs to be transportable - light, sturdy, moveable (all relative)
3. Needs to be durable - needs to last 3-5 years of heavy use
4. Needs to be efficient - low fuel requirements, low maintenance
5. Needs to be simple and reliable

We ended up following a proven design that was relatively simple to construct and to operate. Our UDS has three, ¾" intakes (2 capped and 1 ball valve) mounted 2" from the bottom of the drum, a fabricated

fire basket, a single grate 24" above the fire grate, and uses the 2" bung hole on the flat drum lid for exhaust. We added 3 handles (two on the body and one on the lid) for convenience.

We purposely did not want to make the drum fancy because it is going to be heavily used and get dirty and greasy. If it looked too good to begin with we might feel obligated to clean it after every use or touch up the paint after getting knocked around on a trailer, and that would be no fun. And if it looks too pretty, you just can't call it an Ugly Drum Smoker.

Although we did add a couple of luxury features (i.e., pit thermometer, exhaust damper) we tried to stay true to KISS (keep it simple stupid) throughout. Every feature you add increases the cost, the weight, and the complexity. The unit absolutely must be airtight from top to bottom and every hole you drill is susceptible to leaks and weakens the natural strength. Keep in mind that these drums are made of relatively thin steel.

### **Parts List**

| <b>Item</b>  | <b>Where We Purchased</b> | <b>We Paid</b> |
|--|---------------------------|----------------|
| 1 - reconditioned 55 gal carbon steel drum w/ 2" bung on lid | Barrel/Container Company  | \$30           |
| 1 - ¾" brass ball valve                                      | Home Depot - Plumbing     | \$9            |
| 3 - ¾" x close black steel pipe nipples                      | Home Depot - Plumbing     | \$3            |
| 2 - ¾" black steel pipe caps                                 | Home Depot - Plumbing     | \$4            |
| 6 - ¾" conduit nuts  | Home Depot - Electrical   | \$2            |
| 4 - 1 ½" x ¼" bolts, ¼" nuts, ¼" lock washers (grill mount)  | Home Depot - Hardware     | \$2            |
| 3 - Handles  | Home Depot - Hardware     | \$18           |
| 6 - #12-24 x ½" bolts, ¼" washers, ¼" nuts (handles)         | Home Depot - Hardware     | \$3            |
| 1 - 22.5" Weber Grill Grate                                  | Home Depot - BBQ          | \$19           |
| 1 - Grill Cover (30" diameter by 36" tall universal)         | Home Depot - BBQ          | \$8            |
| 1 - Fire Basket  | Welding Shop              | \$45           |
| 1 - Wiggle Rod   | Welding Shop              | \$5            |
| 1 - Pit Thermometer  | BBQ Store                 | \$30           |
| 1 - conduit cover blank                                      | Home Depot - Electrical   | \$1            |
| 1 - 1" x ¼" bolt, ¼" washer, ¼" nut                          | Home Depot - Hardware     | \$1            |
| ½ - 13/32" x 2 ¾" x .047" compression spring (cut in half)   | Home Depot - Hardware     | \$1            |
| 7 - ¾" Washers (spacers on nipples)                          | Hardware Store            | \$5            |
|  |                           |                |
|  |                           |                |
|  |                           |                |
| <b>Total Cost for Parts</b>                                  |                           | <b>\$186</b>   |

### **Tools Needed**

- Step Bit capable of 1" holes (you could use a hole saw instead)
- Power drill with several standard size drill bits
- Adjustable wrench or sockets
- Flathead screwdriver

## **Getting the Drum**

Finding a suitable drum takes a little time. We did not want to spend the hours of manual labor it takes to burn out and then sand out a liner so getting an unlined drum was very important to us. We also knew that our selected design required what's called an "open head" drum. If you get a closed head drum you'll have to cut one or both ends off and that seemed to require more tools and skills than we have. After a little research, we knew we were looking for a reconditioned 55 gallon open head carbon steel drum. Reconditioned drums usually do not have a liner but do have a fresh coat of external paint.

We looked on Craigslist and found a few used drums for \$10 but they had liners and needed new outside paint. We turned went to <http://www.local.com> and searched for "55 gallon open head drum" and one of the returns was called A1 Barrel Company and was located about 10 miles away. A quick call to them confirmed they had what we needed so we purchased 4 re-conditioned drums for \$30 each. One thing to note is that not all 55 gallon drums are the same size. Three of ours have a 23" diameter and one has a 24" diameter but is a little shorter. If using our plans, make sure that the Weber grill will fit or you'll need to come up with another grill solution.

One popular modification that we did not make is to add a second grill grate 1" below the top and use a Weber Kettle lid so you can effectively double the cooking capacity. Since we have many smokers and four of these UDS units, we did not need or want to add a second grate. Working with multi-level vertical smokers is a pain when you have to take one grill out to get to the lower grill and we just didn't want the added hassle. This modification can always be done at a later time too if our situation changes. If you do decide to add a second grill and use the Weber Kettle lid, make sure and take it with you and test fit it when getting your drum.

I've talked to several people that have a hard time finding a drum to use. I can understand the dilemma for those who live in rural areas and can only wish you luck in your search. We live in Kansas City which is the 32<sup>nd</sup> largest market in the United States. I would think that there is a similar barrel or container company in each of the 31 larger markets. If you don't mind the extra work involved in burning a drum out and sanding it down, you can call junk yards, salvage lots, feed lots (feed), large restaurants or restaurant supply companies (juices, cooking oils), machine shops (mineral oil) or any other industrial type business that actually uses the drums for material storage. Unless you know for certain, stay away from drums used to store hazardous materials and consult a professional before working with a drum that was used to store flammable or explosive materials. Many companies will give you a used drum for free or a nominal charge.

Below is a picture of our drum:



### **Fire Basket**

We have no metal working skills or equipment so the fire basket was the biggest challenge. It's probably the single most important design element of the unit. A poorly designed fire basket will negate the proven functionality of these cookers. Most of the best designs we saw used welded expanded steel. Some industrious non-welders made similar contraptions using expanded steel that was wired together at overlapping points. And many ingenious folks came up with creative designs using "junk" they had lying around (i.e., coffee cans, charcoal grates, buckets, pans, washing machine drum, etc.).

We "cheated" and had the fire basket fabricated by a welding/machine shop that does modifications and repairs on our offset cooker. They charged \$45 for each basket of which \$12 was for parts and \$33 was for labor. Again, for us convenience was more important than cost. If you haven't commissioned machine shop work before, take our specs and picture below to a welder or machine shop in your neighborhood. Explain what it is to be used for and get a quote. They might have suggestions to improve or reduce the cost of the design. I trust the company I use so I tell them how I need it to function and let them handle it from there.

Our fire basket unit consists of:

- 18" ash pan that sits 1" up from the base of the drum
- 16" diameter by 9" high basket that holds the coals and wood sitting 2-3" above the ash pan
- A handle that our hooked wiggle rod can grab to remove the ashes from the drum
- A separate 36" hooked wiggle rod with a handle made from 7/16" steel

You want to use a concave type ash pan to make cleaning the drum easier. Once you cook on your drum and it's greasy, you'll no longer be able to pick the drum up and dump the ash out because it will stick to the sides. Without an ash pan, you'd need a scoop or hoe to remove the ashes. The ash pan should be wide enough to cover most of the drum but narrow enough to lift out of the barrel without hitting the screws and nipples mounted to the inside of the drum. 18" is about right. You also want the ash pan to sit off the floor of the drum so more heat radiates up instead of into the base of the drum.

The coal basket needs to be big enough to hold 12 lbs. of charcoal and some wood chunks which should be plenty of fuel for longer cooks (brisket, pork butt, beef chuck roasts). Our design will hold 20 lbs. of briquettes if ever needed. Once you start a cook, there is no easy way to add fuel and extend the cooking time. Also, for even heating purposes, a wider shorter basket is better than a narrower taller basket. The coal basket should sit 2-3" above the ash pan so ash can freely drop from the spent fuel or your fire will self extinguish in the middle of the cook. The wiggle rod is used to remove the ash pan and also to shake it from time to time to stir up the coals and shake excess ash from the coal basket. The

picture on the left below shows 3 fire baskets with the wiggle rod lying on top. The picture on the right is a close-up of our fire basket.



## **Assembly**

Once you have all of the parts and tools, and know what you are doing, the actual assembly is relatively easy. Our first UDS took about 2 hours to assemble. Be prepared to adjust for the unexpected. Chances are your drum is slightly different than the ones we used. You may need to alter your design to accommodate for these differences.

Take your time. The goal should be to produce a great cooker, not a hastily assembled cooker. Read and re-read this document until you understand it. Before drilling holes, make sure you know where every part is going to go and how it is going to fit. Measure two or three times and drill your holes slowly and carefully. When using the step bit continually check for fit. There isn't much you can do except alter the design once you drill a hole too big.

Always drill pilot holes with your smallest drill bit. Drilling on a curved surfaced can be tough (the bit slips) but we had no problems with a small pilot bit. It is handy, but not necessary, to have one drill (preferably cordless) with the pilot bit, and use a second drill (powerful enough for the step bit) for all of your other bits.

Also, consider the work surface you are going to use. The steel used in the drum is thin and relatively easy to dent or bend. We used 2 small saw horses to balance our drum on while working with it. We used bungee cords on the legs to keep the saw horses from separating and the barrel from falling between them.

### **Step 1 – Remove the Lid and Gaskets**

Open head drums are sealed with either a lever locking ring or bolted locking ring. Ours had bolted rings tightened with bolts with 15/16" heads that needed to be loosened. Either unbolt or use the lever to loosen the band and remove the lid.

Make sure there is not paint or liner on the inside of the drum and lid. If there is, you'll need to burn and sand it out.

Remove the bung from the lid by rotating counter-clockwise. A flat head screw driver used as lever and handle works great for this task. Remove the rubber gasket from the bung. Although we are not using

the bung, it is a good idea to keep it around in case you need to seal the bung hole. And, if you decide not to build the exhaust damper, you'll need the bung to seal the drum and extinguish the coals.

Remove the foam rubber gasket from the rim of the lid. A flat head screwdriver works well for this purpose. Either scrape or use a solvent to remove any excess adhesive from the lid gasket.



## **Step 2 – Create the Intakes**

This is by far and away the hardest part. Use a step drill bit to make three, 1" holes evenly spaced around the drum 2" above the base. Multiply the diameter of your drum times 3.14 and then divide that result by 3 to get the distance of the space needed between the holes around the barrel. For example if your drum has a 23.5" outer diameter, then space the holes 24.6" apart.

Use a small drill bit and make a pilot hole. Once the pilot hole is drilled, switch to the step drill bit and continue drilling the hole. As you approach 1" on the step bit, stop and test fit the nipples often. You want a perfect fit and want to avoid making a bigger hole than needed.

Thread a 3/4" x Close black pipe nipple into each hole. To do this, tighten a conduit nut on one end of the nipple. The close nipples we used bulged in the center so the conduit nuts wouldn't thread to the center. Thread the nipple from the inside of the barrel until the conduit nut is tight against the inside. When working inside the barrel, consider using a headband lamp or have another light source available so you can see what you are doing.

Then, slip two, 3/4" washers around the outside of the nipple. You may need to use the step bit and mill the inside diameter of the washers out enough so it slips over the nipple and is flush with the outside of the barrel. For the ball valve nipple, you may need three, 3/4" washers. For the capped nipples, tighten a conduit nut on the nipple after the washers.

On two of the external nipples, screw on a cap. On the third, screw the ball valve on so the end of the handle turns towards the outside of the barrel and the top of the handle faces the top of the cooker.



### **Step 3 – Install the Grill Mounts**

If you've used our fire basket design and the drum is a standard 34+" tall, you want to mount the grill grate about 7" below the top. This will give you the desired 24" clearance between the charcoal grate of the fire basket and the grill grate. It will also give you plenty of room to cook brisket, pork butt, and most roasts. If you're going to cook beer can chicken or turkey, you'll need to use a Weber lid for those cooks.

Drill 4 evenly spaced ¼" holes that are 7" below the top of your drum. Insert ¼" x 1 ½" bolts with a washer in each hole. Tighten a ¼" lock washer and nut on the bolt end inside of the drum. These inward facing posts will support the grill.

Place your grill on top the mounts and make sure it is even.



### **Step 4 – Install the Body Handles**

Install the handles on opposite side of the drum just below the first ridge. They will likely be above the grill mounts you just installed. Use ½" long bolts for the handles so they don't interfere with the grate. Use a lock washer under the nut. Mark the barrel using the actual handles and drill the appropriate size holes for the bolts.



### **Step 5 – Install the Exhaust Damper**

You can mount a 2" exhaust stack in the bung hole without any extra drilling. We saw 2" electrical conduit that was threaded and could be used for an economical stack at Home Depot. Instead, we opted to install a simple swivel damper under a compression spring. We used a 2" bolt, nuts, washers and the spring to hold an electrical conduit cover plate in place and allow it to be adjusted by swiveling. We obtained all of this hardware at Home Depot. The conduit plates already have a hole drilled in the corner so that's one less thing to do. See the picture below.



### **Step 6 – Install the Pit Thermometer & Lid Handle**

We used the step drill bit to drill a hole in the lid for our pit thermometer. Some people mount the thermometer on the side at the grate level. Both locations have advantages and disadvantages and some folks mount probes in both locations. Our plans use a large fire basket and we didn't want anything longer than 1 ¼" sticking in from the side that might make removing the fire basket difficult. So we choose to use the lid for our thermometer.

The temperature at the lid is 50F lower than the temperature of the center of the grill. During our test burn and seasoning, we mounted a digital thermometer probe in the center of the grill and calibrated our probe on the lid to match the digital read out so now our lid probe reads grill temperature. We used a \$30 Horizon pit thermometer. We could have scavenged or even purchased a suitable one for less. Some UDS cooks don't use a thermometer at all and still turn out great food. One thing to note is that our lid mounted thermometers are calibrated for an empty grill. During a cook, the lid will still read 25F lower than a full grill. Not a problem, we get the smoker up to temperature when starting and just add 25F to the lid reading when cooking.

Placing the handle in the center of the lid, we drilled holes sized for the bolts used to secure the handle to the lid. After adding a washer and nut and tightening both bolts, the handle was mounted.



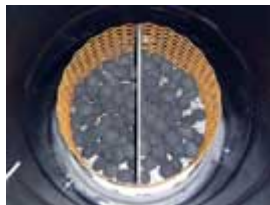
Assembly done! Below is a picture of our assembled cooker. The picture on the right shows the 30" x 36" universal grill cover from Home Depot.





### **Step 6 – Season and Test the Cooker...Calibrate Thermometer**

After the cooker was assembled, we needed to test fire it to check for functionality and leaks. We also needed to season it before cooking on it. We were fairly confident in the design and seasoned our cooker while doing a test burn. If we ended up needing to make any big modifications inside the barrel, it would have been better to test fire first and then season. But we decided to save a step and do both at once. We rubbed a light coat of peanut oil on the inside of the drum, loaded 5 lbs. of charcoal in the basket, placed the basket in the drum, opened the valve and both caps, and lit the coals with a weed burner. The cooker topped out at and maintained 300F for 3 hours before the temps started to drop.



### **Step 7 – Cook Some Food**

The last thing we had to do was cook food on the new UDS. We opted for chicken since it is relatively cheap and quick. This time, we loaded 11 lbs. of briquettes in the basket and lit the coals, leaving 1 cap off and the ball valve open. It reached 250F (we cook most of our BBQ at 250F) within 10 minutes. For a quick test, we cranked down the ball valve to make sure we could stabilize the temperatures at this level. The drum temps reached 260F before falling back down and stabilizing at 250F about 15 minutes later. Once this simple test was done, we opened the ball valve all of the way and let the drum climb to 300F. We threw some hickory chunks in the fire basket and chicken on grill. 45 minutes later, we were enjoying some delicious BBQ chicken.

With the food off the grill, the temperature climbed to 367F before we shut it down for the night. We still had 1 nipple cap on and could have gone above 400F if needed so it definitely met our design specs. The next morning, we noted that about 3/4's of our starting coal was still intact in the basket and ready for the next cook.

The fire basket design we used needs to be about half full (11 lbs. of briquettes) for optimum performance, even for short cooks. This doesn't mean we will be wasting fuel as we can close the intake and exhaust and extinguish the coals when we are done.



## **Possible Modifications**

A cool feature of building your own UDS is that you, as the manufacturer, can modify it at any time with confidence. You can create a perfect cooker that fits your cooking style. There are some popular modifications that we did not do...yet. One piece of advice we heard and adhered to is “build a simple one first and modify over time or build another one”. Check this thread from time to time for updates on how we’ve enhanced our drums. Here’s a list of some of the more popular modifications we’ve seen:

- Adding a second grill and kettle lid – doubles cook capacity
- Adding a bottle opener – extra functionality
- Adding tool hooks – a place to hang your tongs
- Adding a lid hook – similar to a Weber kettle
- Using vertical intake pipes – No bending over to adjust intake flow
- Adding an exhaust stack – looks cool, may improve draft if needed
- Forced draft system – BBQ Guru or Stoker makes temp control even easier
- Access Door – makes it easier to access fire basket or lower grill if used
- Separate Bottom Section – Makes it easy to clean
- Adding grate level side thermometer – better read of temps at food level
- Adding a side table – provides valuable work surface for preparation and gadget storage
- Adding a rotisserie – hard to beat rotisserie chicken
- Chrome or Stainless Parts – Use chrome or stainless steel parts to enhance the look. You can even use a stainless steel drum.
- Custom Paint – Lots of colors to choose from, use automotive or engine block paint for best selection
- Get a Drum Dolly – For around \$25 you can mount the drum on caster wheels. With a little ingenuity, you can use all terrain tires.