

## **Top Ten Things to Know Before You Call a Field Machining Company** *The Insider's Guide to Hiring Portable Machining and Welding Repairs . . .*

It is Saturday. You are on your deck, basking in the sun, enjoying a cold one and eyeing your grill for the precise flipping moment when your cell phone rings. The line is down, or was slowed down due to mechanical challenges, and your machinery is going to require on site machining and weld repairs to bring the line (valve, turbine, mill, press, fan, boiler water circulation pump, forge, hammer, etc . . .) back to full production.

10) **The magic in field machining happens before leaving the shop.** There is no one-size-fits all magical piece of portable machining equipment, beyond something really simple like a flange facing machine. The secret sauce in successfully completing complex on site portable machining repairs using field machining equipment is proper fixture design and manufacturing. Engineering the design and manufacturing the proper fixture occurs at the portable field machining company physical plant, which at a specialized field machining company consists of a large traditional machine shop. Understand before you call that proper time spent building fixtures in the field machining company's shop may save the day for you at your plant.

9) **The first portable machining company to arrive may not be the first to complete the project.**

Many portable machining companies will load a truck with boring bars, milling machines, portable machines shops, and men, and race to your site ten minutes after you give them the purchase order. "We will be there in six hours." "We can be there at 4:00 a.m. Sunday morning." "We will be there twenty-five minutes ago." What are they going to do when they arrive? They will review drawings, review the machine, spend hours meeting with you and your staff, and then formulate a repair procedure. What comes after that? Fixturing. Where does that fixturing occur? In your shop, at a local machine shop, or most likely, at the shop they just left a thousand miles behind to "win" the race to your site. Understand before calling that it's the first to complete, not the first to arrive, that wins the day.

8) **What's the cost of doing nothing? The real cost of doing nothing?** Be realistic about what it's costing you to be down, and then add to that how much more it will cost to be down again if a short term fix is applied, rather than a long term, professionally executed repair. A well known field machining company was contacted by a machine shop to repair their customer's equipment. Their customer manufactured a specialty polymer fabric. A damaged roll in the customer's production machine was costing \$1,500 a day in wasted raw materials—\$45,000 in per month. The field machining quotation was \$41,245 to repair the line in forty-eight hours—either that machine earns more than \$240,000 in forty-eight hours (unlikely) and so a six month payback was not worth it, or (more likely) perhaps the customer didn't do the math on the true cost of the wasted product. The repair remains undone. Is it cheaper to do nothing or is it worth fixing?

7) **Where are the drawings, written work scope, and photographs? How will the field machining company attach its equipment?**

A dimensional drawing is necessary—if you don't have a dimensional drawing, make a dimensional hand sketch or CAD drawing. A written work scope ensures that the machinery is machined to the condition you want it—Take the time to write a work scope—nothing fancy—nothing long—bullet points are all that are needed. Photographs (with a stretched tape measure visible) showing not only dimensions of the work piece area(s) but also showing obstructions (walls, pipes, columns, beams) and clearances around the area to be machined are required data. Many field

machining repairs are designed, fixtured and executed without a site inspection visit. This is possible only because the maintenance manager, purchasing agent, outage planner, or project engineer has issued to the field machining company, in electronic files, wherever possible: 1) Dimensional drawings (or dimensional CAD and/or a hand sketch) showing a) what it is, now, and b) what it needs to be after repair. 2) Written work scope documenting existing as-found and desired as-left conditions. 3) Distances and clearances to all obstructions near the machined area. 4) Composition of material to be machined or welded. 5) Bolt circle, size, thread, depth, pattern, if the field machining equipment is being bolted to a bolt circle or bolt pattern. What is the material of frame if the fixture is to be welded to the frame? Field machining equipment usually needs to be mounted to the machine being repaired or to the floor. 6) Take photographs when the machine is down for inspection. Far more times than not, the machine was taken down, measured, inspected and reassembled and then, weeks or months later, the work scope is written, and the photographs sent are of the machine assembled and running. Whoops! Take photographs while the machine is torn down, and in the condition it will be when the future repairs are made. 7) Date the outage starts, date the outage ends, and how many of the outage shifts are dedicated to the repair/how many shifts of the outage will the repair area be accessible?

**6) What are you willing to, what can you, and what have you, removed prior to the portable machining company's arrival?** Typically, portable machining companies arrive, machine, weld, machine and leave, or some combination of that system. Do you want a shorter downtime? Don't wait until after the machinists arrive to have your mechanics tear down the machinery (yes, this happens). Expect to be issued a work change order increasing both the price and the length of the repair, if the machining company incurs standing time. If you need millwrights for tear down and reassembly, make sure that is spelled out in your work scope. Also, don't expect the machining company to reassemble after welding/machining, if the machining company wasn't the party who disassembled the equipment, and/or reassembly was not in the work scope.

**5) Additions to price estimate.** Several things can lead to an increase in the price estimate, including but not limited to crane/off loading delays of equipment, standing time waiting for access to the equipment, time spent on site attending mandatory safety training, incorrect specifications, incorrect dimensions, obstructions not disclosed on the drawings, or incorrect material composition being reported: E.g: Inaccurately reporting in your work scope that the material is a 50 Rockwell hardness which turns out to be a 70 Rockwell hardness is going to dramatically increase both the outage duration and total price. Also, if the quote is issued as "weekday pricing" but when the time comes the repair occurs over a Saturday and Sunday, expect a reasonable increase for the higher overtime rates.

**4) Cheaper, or less costly, than shop machining?** What are your true costs of being down? If your machine is not critical path, there are no orders waiting on that machine, you have the manpower to disassemble the pieces, and you have the time to ship the damaged pieces out to a shop for weld and machining repairs, you may want to consider that option. *Field machining is your lowest cost alternative* when it absolutely, positively cannot come apart, and/or when the repairs absolutely, positively have to be done in the shortest amount of down time. Field machining is the fastest method to machinery repair turnaround, and thus is often the absolute cheapest method given your loss of operating revenue, versus the higher cost to repair on site. Knowing your real numbers is the best way to get your field machining project budgeted and approved in a hurry. Numbers speak louder than words.

3) **Lead times can vary, widely.** Emergency stud removal mobilization time, from the time the field machining company receives your telephone phone call until they are driving down the road, could be as little as fifteen minutes. Machining down your 15-5PH, 12” diameter shaft journal area, fitting a new 15-5PH split sleeve, welding that sleeve in place, and machining it back to 12.0005” could require a one month lead time due to having the sleeves custom forged and heat treated prior to machining to size, all of which occurs prior to arriving on site.

2) **Know your Material and its Condition.** Is the material being machined 410SS, 309SS, carbon steel, cast steel, cast iron, or . . . ? Has the material been heat treated, torched, hardened, exposed to constant high temperatures or otherwise had its properties changed? Has it been welded? How was it welded? Recently a well known field machining company was hired to machine six areas on a trunnion ring in a stainless steel plant. The wear areas were stick welded prior to the field machining company’s arrival. Two of the six areas were mistakenly welded with a non ferrous weld media resulting in massive glass slagging and excessively hard conditions. These two areas, due to the errant weld procedure, required multiple twelve hour shifts of hand grinding prior to resuming machining. The plant thought they would save money using their welders instead of the machining company’s welders—the end result was a forty-percent increase to the estimated price, do to work scope increase. Know your material and its condition.

1) **Hard Money, Job Costing.** There are five main line item costs to a field machining project. 1) **Shop prep.** This cost includes all material for fixtures, labor hours for fixture design, labor hours for fixture manufacture, and labor hours to prep and adjust machines. 2) **Mob/Demob** of men and machines. For emergency jobs, a “hot shot” or dedicated truck driving straight through to the destination delivers the fixtures and equipment. If it is five hundred miles or less from the field machining company’s shop to your plant, the field machining company will typically use its own trucks and men for mob/debmob. For emergency jobs where distances greater than 500 miles, a driving team of two professional drivers and dedicated truck are often used. In the latter instance, the machinists and welders are typically flown in. In extremely expensive per-hour-down forced outage situations often found in power plant settings, all tools, fixtures, men and machines can be flown to the job site. 3) **Machine and tool rentals.** A field machining project may require anywhere between \$20,000 and \$250,000 worth of field machining equipment. The field machining company typically owns all of its machines and charges a nominal daily rate. Occasionally, highly specialized but rarely used machines are necessary and the field machining company rents those machines from machine manufacturing companies specializing in renting specialized, expensive portable field machine tools. 4) **On Site Labor.** This cost runs any ware from a low of 30% of the cost of a job on up to 80% or more of the cost of a job—depending on the length of the job and the distance traveled. 5) **Lodging/Per Diem/Rental Cars.** Typically around 8% to 13% of the cost of the job are the expenses incurred by the men while on site.

## Conclusions

Just how affordable is field machining? The shorter answer is, it depends. There are myriad variables affecting the final cost. In “Sample Job One” below, note that there was extensive shop preparation labor and material purchases, as well as extensive travel expenses. On this project the field machining company was required to produce forgings from which they manufactured sleeves. This job was over 1,000 miles away. Note that only 30% of Sample Job One was on site labor, whereas 48% of Sample Job Two was on site labor.

Portable Machining Project - Sample Categories Figuring Into a Job's Cost	Sample Job One Line Item	Sample Job One % of Job	Sample Job Two Line Item	Sample Job Two % of Job
Design Labor, Shop Manufacturing Labor, and Mob/Demob Labor	\$13,654	27%	\$6,816	28%
PURCHASES - Materials and Services	\$6,160	12%	\$42	0%
FIELD ON SITE LABOR	\$15,360	30%	\$11,520	48%
Machine tool rental fee	\$2,848	6%	\$1,886	8%
Manpower transportation costs	\$2,629	5%	\$687	3%
Manpower Lodging	\$3,960	8%	\$1,320	5%
Manpower Per Diems	\$2,340	5%	\$1,300	5%
Trucking – Inside and/or Outside Vendors	\$4,180	8%	\$637	3%
	\$51,131	100%	\$24,208	100%

**Considering T&M** Time and material projects allow the field machining company to invoice only exactly the costs spent repairing the machinery. When asked to bid “hard money” or “not to exceed” the company is forced to consider “what if scenarios” and factor that into the hard money bid. Quoting is half art and half science because field machining entails, literally and figuratively, many moving parts. A budgetary estimate with an agreement that the estimate is a good faith estimate which could go up or down, could save you money in the end.

The bottom line is collect all the data recommended herein, and then press send. This will ensure your receiving your quotation in the shortest possible time.

### **About the Author**

Tony Piwowarczyk is the Director, Business Development for Field System Machining, better known as “Field Systems.” Field Systems has been solving portable machining and welding outage challenges at steel mills, power plants, aluminum mills, extrusion plants, automotive plants, chemical plants, chocolate factories and just about every other industrial setting you can imagine.

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