The Barn Raiser

Mid-South Engineering Company

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When is Cogeneration Right?

If you use steam in any of your production processes, the question has probably already been raised. When is co-generation right for you? The answers to that question has to be answered by asking a few more questions, but ultimately everyone knows that it is a matter of economics.

If your boiler uses fossil fuels, such as natural gas, fuel oil, or coal to generate the steam, then the question may be, are the costs of purchasing electrical power expensive enough to justify cogeneration? If on the other hand, your production process generates by-products suitable for boiler fuel, and which you either pay to have disposed, or you receive little or no monetary compensation for them, then co-generation may need to be explored sooner.

If you don't use steam then there are many factors that influence the system design selection process. However, perhaps the most important consideration is the thermal-to-electric (T/E) load ratio. Each system type presents slightly different thermodynamic considerations, which in turn affects how economically the system can meet a given T/E load. A facility's T/E ratio can be calculated:

T/E = Avg. lbs/hr Steam*1000/Avg KW*3412

Using the T/E helps pick a possible system design:

- T/E of 0.5 to 1.5; Suggest Diesel Generators
- T/E of 1 to 10; Consider Gas Turbine
- T/E of 3 to 20: Consider Steam Turbine

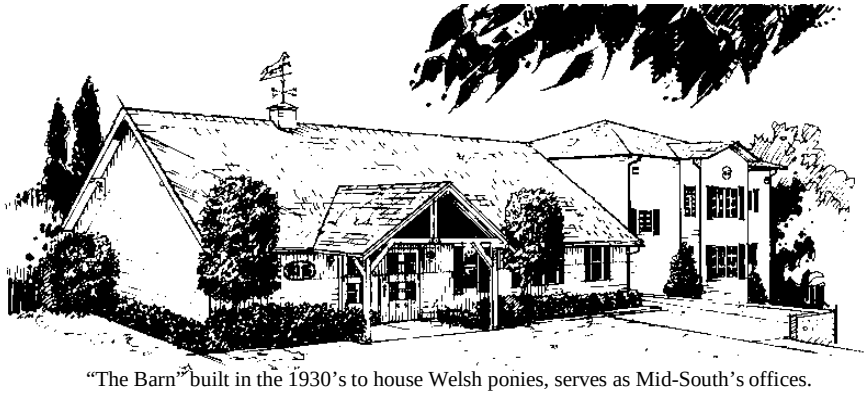
The co-generation economic feasibility needs to take into consideration:

- The cost of fuel
- Electrical load & costs
- Steam load (Is it seasonal?)
- Maintenance costs
- Utilities infrastructure (Age/Reliability)
- Downtimes
- Cycle thermal efficiency of a system

Using these pieces of information the economic pay back needs to be calculated for your system.

An initial cogeneration feasibility screening is not difficult if some basic system design parameters and feasibility issues are understood. However, the ability to perform an initial screening can be a significant barrier to a more widespread application of this important technology. As the world progresses in a dynamic and often volatile utility industry, the need for economical, reliable, and environmentally responsible power is expected to grow. Since cogeneration systems can and do fill this need, widespread applications are expected to increase and play an important role in industry.

Adapted from Energy Users News 10/2002



"The Barn" built in the 1930's to house Welsh ponies, serves as Mid-South's offices.

Grout Types and Their Application

Grout Products have become very numerous over the years and it seems that every grout manufacturer has an entire line of products that will accomplish almost any task you could imagine. For a single application, the difference in price among the different types of grout is not really significant. However, when you are implementing a full-scale expansion or renovation project, the grout expense alone could reach well into the thousands of dollars.

There are basically two major types of commonly used grout and you should know the difference between the two and where each is most applicable. The two major types of grout are non-shrink cement-based grout and epoxy grout. The cheaper of the two grouts discussed in this article is non-shrink cement-based grout. It is exactly what it says it is; a cement based material that does not shrink as it dries, allowing bearing contact between the grout and the base plate. This grout is most commonly used under column base plates and stationary, non-vibratory equipment. It is more economical than epoxy grout and will perform well when used in the right environment. Epoxy grout is significantly more expensive than the non-shrink cement-based grout. Epoxy grout is normally a three component system comprised of resin, hardener, and aggregate. It, also, does not shrink and can be slightly expansive ensuring proper bearing. Epoxy grout also achieves much higher compressive strengths than the non-shrink cement-based grout - up to twice as high stress depending on brand and application. Normally, epoxy grout is used under dynamic vibratory machinery. It seems to perform well in high stress environments where non-shrink cement-based grouts tend to fail. Knowing the difference between grout types and where each is applicable will help ensure proper grout performance as economically as possible.

Proper Wire Sizing

Do you understand the meaning of **Ampacity**? Very few of us probably do; but, if you are trying to choose the proper wire size for your power distribution systems then you really need someone who does. When designing an electrical circuit, the National Electric Code's (NEC) table 310-16 is normally used to determine the **ampacity** of various wire sizes. This table contains three different columns showing the different **ampacities** for any given wire size depending upon the wire insulation's rated operating temperature of either 60, 75, or 90 degrees centigrade, such as types TW, THWN, and THHN insulation respectively.

Ampacity in layman's terms is the current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding the wire's temperature rating. On the surface, we would think that the NEC table for choosing the proper wire size to carry a load of 70 amps and the better THHN type insulation would result in choosing a #6 AWG copper wire. *Surprisingly, the answer in our example was WRONG!* We failed to take into consideration the rating of the electrical equipment which has a dramatic affect on our choice of wire size. As shown in NEC section 110-14, the basic rules for sizing conductors based on the temperature limitations of equipment requires that any equipment rated 100 amps or less must have the conductors sized based on the **ampacity** shown in the 60 degree centigrade column. Using the 90 degree column as we did, would have resulted in us overheating the equipment terminals and the equipment enclosure. By using the correct temperature column we would instead choose a wire size of #4 AWG, even if type THHN insulation is purchased.

Ampacity shown in the 90 degree column can be used only for the de-rating calculations that must be performed when more than 3 current-carrying conductors are installed in the same conduit, or when the conductors are installed in an environment where the ambient temperature is higher than 30 degrees centigrade.

Being ignorant of a situation is not good, but ignorance can be overcome with education. In the case of choosing the correct wire size, where numerous conductors must be considered, the smart thing to do would be to choose someone who understands NEC rules on **ampacity.**

Mid-South Engineering Company

1658 Malvern Ave (71901)
P.O. Box 1399
Hot Springs, Arkansas 71902
Telephone: 501-321-BARN (2276)

Contact: **Mark Culpepper** mculpepper@mseco.com

Web Site: www.mseco.com