The Modified Chilton Factor for Utilization as used by Pritchard & Abbott, Inc.

Basis

The original Chilton factor is an equation that dates back to approximately 1950. This factor was created for estimating construction costs of industrial processes and plants based on production capacity. The Chilton equation recognizes the exponential relationship encountered when scaling a known cost by using a ratio between a known and a proposed production capacity. In simpler terms, the Chilton formula is based on economies of scale. Constructing a facility that has twice the production capability does not double the construction cost, for example.

The original equation below was created to estimate construction cost based on a different production capacity:

$$Cost\ Scale\ Factor\ as\ a\ Percent = \left[\left\{ \frac{Capacity\ B}{Capacity\ A} \right\}^{n} \right] \times 100$$

Where *Capacity A* = Proposed Design Capacity;

Capacity B = Known Production Capacity;

and n = exponent or scale factor.

The exponent *n* in the above equation is normally 0.6 or 0.7 depending on the type of facility or equipment. This equation has been adopted by many appraisers without modification to create an economic obsolescence factor based on “utilization.” There are even several appraisal books that promote the use of this equation in this fashion – in error, in our opinion.

Problems

There are several reasons why it is wrong to apply this equation directly to appraisals to account for production changes. First, this equation is based on the cost for building plants of different sizes and does not take into account that reducing the production of an existing plant does not normally translate into an equivalent portion of equipment being out of service. Secondly, taking this equation to the extreme of zero production (zero utilization compared to capacity) would produce an economic obsolescence factor of 100%, leading to a conclusion of zero value for the equipment or facility. We submit this is an absurd result in the vast majority of cases. Simply turning off or shutting down a piece of equipment does not automatically mean that it must have zero value. Finally, by using the "Chilton" adjustment directly you would be fully recognizing the effects of management's operational decisions that may or may not be solely a result of external economic issues.

Solution

It is generally accepted that equipment readily available to be utilized (i.e., is still functional) that happens to be temporarily idle still retains at least half of its depreciated value. One way to adjust for the amount of production, to provide a lower limit of 50%, and to limit the effect of specious or obtuse management decisions is to average the existing facility with one that is available to be operated at full capacity but is not for temporary causes using the equation below:

$$Economic\ Obsolescence\ Factor\ as\ a\ Percent = \frac{\left[\left\{\frac{Capacity\ B}{Capacity\ A}\right\}^{n} + 1\right]}{2} \times 100$$

Where *Capacity A*	=	Design capacity;
Capacity B	=	Actual production;
and n	=	exponent or scale factor.

This equation has a natural lower limit of 50%. This equation is only intended for working equipment that is temporarily idle. If the equipment is not capable of operation without repair, or if the idle status is for obviously more than a temporary period, then some additional obsolescence may be warranted.

Exceptions

If the equipment is easily moved, these equations may not apply at all. Movable equipment can be sold as long as there is a market for it. For example, take the situation where a business has two identical forklifts manufactured in the same year. One of the forklifts is used 5 days a week and the other is used 7 days a week. When the forklifts are to be sold, they will normally have the same market value. If equipment is not used because an employer does not want to pay high enough salaries to attract enough employees to operate the equipment full time, then that is a business decision that does not affect the underlying value of the equipment.

On the other hand, if there is not enough work available in the market to keep the equipment busy, then there should be additional economic obsolescence (other than that derived by the modified utilization formula above) applied.

Conclusion

When the origins of the Chilton equation and its various shortcomings for use in appraisal work are understood, it becomes apparent that the original formula should not be used directly to estimate economic obsolescence. It is more appropriate to apply a factor that averages the Chilton equation with a hypothetical plant that is available to operate at full capacity but is not for temporary or extraneous causes to estimate a more accurate amount of economic obsolescence.