

## **BUILDING CEMENT PLANTS WITH USED EQUIPMENT**

Utilizing used equipment to build a cement plant is not always economically attractive as it may appear at face value. Although the cost of the equipment appears to be favorable, there are many factors which need to be considered in the capital cost analysis (CapEx). In most cases, the equipment is sold in place at the plant being dismantled. This is true with most major process equipment. The buyer carries the cost of dismantling, transporting, and reassembling the equipment. The buyer is also responsible for all Customs imposed export and import procedures, duties and taxes.

The analysis of the feasibility of utilizing used equipment should consider the following points:

### **A. FINANCIAL CHALLENGES**

#### **1. The entire risk is on the Owner**

Most equipment is sold on an as-is where-is basis; hence, a detailed inspection and assessment of the equipment is necessary. The seller will not provide guarantees of any kind (capacity, completeness, equipment condition warranties, etc.). The risk entirely rests with the Owner and it is high considering the ratio of equipment cost to overall investment costs, which amount to hundreds of millions of US Dollars.

#### **2. Performance guarantees and technical support**

No one, including the original OEM, will likely be prepared to provide a performance guarantee in terms of capacity, energy consumption, or quality of the equipment as is normally obtained with new equipment.

#### **3. Schedule risks**

More than likely, not all necessary plant components will be available with the existing used plant. Therefore, new parts have to be identified, ordered and then assembled. In this case, there is no advantage on the project schedule compared to using all new equipment. Production delays due to faulty equipment will result in projected cash flows not materializing because of implementation issues which may counter the savings gained from the procurement of used equipment.

## **B. TECHNICAL CHALLENGES**

### **1. Capacity of the plant**

Capacities of the available used equipment will dictate the new plant capacity rather than the preferred capacity according to the determination of the feasibility study.

Unless all the used equipment comes from a single process line sized for the capacity of the new line and utilizing similar raw materials and fuels, matching the equipment to the new site may require significant modifications. Buying individual equipment is even more challenging and requires a highly skilled process engineer to match equipment to requirements. Process flow sheets and equipment lists need to be developed to prepare a “shopping list” of complementary equipment. If a complete line (raw mill through clinker cooler discharge) is identified, the process engineer needs to identify the modifications required to adjust for the conditions of the new site, such as the difference in elevation which has an effect on the amount of process gases handled.

### **2. System configuration**

Different systems such as raw grinding, coal grinding, pyro-processing system, storage and material handling systems, may or may not be the Owner’s optimal choice for the new plant. The Owner will have to make do with what is available.

### **3. Electrical Systems & Controls**

Highly qualified electrical and control engineers need to evaluate the equipment and determine suitability for the new site conditions. If applicable, it is likely that a power distribution system will still need to be designed and new instrumentation and control system will be required for the new plant.

If the source of the equipment has different voltage and frequency ratings, it is most likely that the electrical drives will not be usable as the equipment would have been designed for different motor speeds.

### **4. Specific transportable equipment**

While heavy equipment is economical to transport due to its high value, equipment such as cyclones, bins, process ducts is not economically transportable even if in good condition. Such equipment is made of thin plates susceptible to damage. Furthermore, the transport costs are based on volume rather than weight and therefore the costs will be disproportionately high.

### 5. Documentation

Documentation is one of the biggest issues with the concept of building a plant with used equipment. Documentation is very important for relocation, reassembly, and also for future maintenance. Generally, the documentation is unorganized and incomplete which becomes a challenge during reconstruction. Specifically, the structural drawings designed for equipment loads, if available, need to be reexamined. More than likely, the soil conditions and wind and earthquake loads at the new location are different and therefore the foundations and structures will have to be redesigned. The availability of equipment drawings is critical to the success of the project. If equipment drawings are not available, it will be necessary to request drawings from the OEMs to avoid the tedious work of taking dimensions in the field.

### 6. Dismantling of equipment

Once used equipment is located, a team of engineers with extensive experience in equipment maintenance needs to be deployed to the site to evaluate its condition. Expertise in rotary kilns, mills, process fans, coolers and other major cement plant equipment is required to do this type of evaluation. It is rare to find used equipment that was shut down and maintained in good condition. Most companies quit doing maintenance on equipment if they know it will be shut down. If the equipment is idle for a long period of time, certain components will deteriorate. In this case, considerable effort and planning are required to ship equipment to maintenance shops to be overhauled.

A skilled team of professionals should be in charge of dismantling the equipment. Match-marking and adding identification to facilitate reassembly, which is best done by the same team. The cost of dismantling depends on the country where the used equipment is located, which is most likely in western countries where costs are high. Often the equipment is still in place which will require hiring a local contractor to disassemble and ship to the new location. A company representative will need to be present to make sure this is done correctly.

Steel structures cost more to disassemble and reassemble compared to new fabricated structural steel sourced in Asia.

7. Problems with identifying missing components

Ancillary Equipment: Unless a complete cement line is found that matches the desired production rate and elevation of the new site, purchasing individual equipment is “hit and miss”. Some equipment can be found, but others will have to be purchased new. Usually auxiliary equipment is not worth the effort to purchase used.

This is technically the most difficult aspect of relocation projects. Several components could be missing or damaged during the shut-down period. Initial inspection or due diligence generally covers an overall visual inspection and does not include detailed inspection of each and every equipment and its internals. In many cases, parts are proprietary items that need to be procured from the OEMs. Such spares are expensive and will be disproportionate in cost to the value of the purchase price of the used equipment.

8. Transit damage

Transit damage risk will be carried by the buyer since the dismantling and packaging will be undertaken by the buyer’s contractor.

**C. CONCLUSION**

Transportable equipment is best limited to major heavy equipment. Parts made of thin plates or embedded in the concrete such as kiln base plates are either likely to be damaged or not worth transporting. Kiln shells with drive and support stations, mills, and large fans are items that may be economical to transport and reassemble.

When a cost is assigned to meet the challenges and risks mentioned above, the overall relocation project costs are generally higher than buying new equipment. However, there are always exceptions to the rule.

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