

Inspection before construction?

Michael Horsfield reflects on the practicality and importance of the prior inspection of materials and equipment purchased for a furnace construction project

Glass producers are continually looking for a minimum glass-to-glass period for a furnace build or rebuild project in order to:

- help reduce capital cost
- minimise the amount of down-time of a particular furnace
- minimise loss of production time
- minimise the risk of not supplying a particular customer, market area or sector for a considerable period of time.

Because of this the modern construction schedule attributed to a furnace build or re-build project has progressively become shorter over the past 15 years or so, to the point where furnace construction schedules are now as short as possible and in some cases they border on negative practicality.

As construction schedules become shorter, the need for all the parameters relative to each furnace build or re-build project to be correct at site is paramount. All the supplied materials and associated equipment for a furnace construction project should be correct to the specified design and function when delivered to site, thus removing the risk of the construction schedule being extended in order to rectify problems. To assist with achieving delivery to site of materials and equipment that are correct to design and function, it is essential to conduct pre-delivery inspections at the suppliers' premises.

PROJECT PLANNING

Pre-delivery inspections should be included in the early stages of the construction project planning schedule, and time should be allocated in the schedule for these inspections to be carried out. Inspection periods will vary for individual categories of supply and their manufacturing requirements prior to delivery. It is therefore essential to discuss manufacturing and delivery times with each selected supplier in order to:

- conclude a practical pre-delivery inspection process
- maximise available resources and personnel disciplines to carry out the inspections
- form a realistic and practical inspection schedule.

In order to include the inspection process, the construction schedule can be divided into three main broad sections: pre-delivery inspections, delivery of materials and equipment, and site construction. Within each section a detailed Gantt chart can be formulated to ensure a flow of tasks identifying key dates, milestones and goals.

INSPECTION

The inspection process should include purchased items including refractory materials, steelwork, ductwork, pipework assemblies, ductwork systems, electrical and

control systems and associated equipment. Items in each category should be checked for general visual quality, actual quality, dimensional accuracy against detail design drawings and cross-checked against corresponding materials or equipment key requirements. An example of the corresponding key requirements is the positioning and location of steelwork items including skewback members, tuckstone members, thrust members and the location of electrodes, bubblers, thermocouples and pyrometers etc.

In addition to inspection against design drawings, the items to be supplied should be checked against a comprehensive Bill of Material in order to ensure that all required items for the construction project are being provided. For associated equipment inspection including instrumentation, control, batch charging, valve trains, level probes, cameras, electric boost systems, bubbler systems etc., 'cold' function testing should be carried out at the manufacturers' premises in addition to the relevant inspection techniques described above.

Function testing should include the following:

- an input / output system test, where every input is electrically connected and the corresponding output tested
- automatically test the equipment to check that all functions operate correctly
- system test all valves to check their operation
- simulate signals within a control system to thermocouples to ensure that all are recording correctly
- test from control graphics, stroke valves etc. to ensure that their functions and workability are correct.

This process will help to identify any malfunction of a system or part

of a given piece of associated equipment and allow the opportunity to rectify any problems prior to delivery.

The inspection process is a tool to identify mistakes against design requirements, misalignment of parts or items relative to corresponding factors, and offer a problem-solving aspect and functionality test.

After the associated equipment has been installed at site, a similar 'live' function test should be carried out prior to glass production to ensure that all the equipment is working correctly when required to do so during furnace operation.

POSSIBLE CONSEQUENCES

Without the inspection process prior to delivery, the possible consequences may have a serious effect on the construction schedule. These may include:

- a misalignment of steelwork to refractory
- a misalignment of pipework, ductwork and electrical cabling to final positions
- a conflict of item positioning
- a malfunction of equipment, systems and parts operation
- having to rectify problems at site during the construction period
- sending equipment back to the manufacturer for rectification of problems away from site
- the danger of structures having incorrect stability and future problems being encountered during furnace operation
- delays in the construction schedule and consequent associated delays
- the glass production date not being achieved
- commercial irregularities
- a possible loss of customers, markets or sectors.

A typical inspection schedule consists of an inspection of the purchased materials and associated

equipment at the manufacturers' premises prior to delivery to site, delivery to site, and then a visual inspection on delivery including checking items against the relevant Bill of Material.

The advantages of inspection before construction include construction without major problems and delays, meeting the construction schedule deadline date without consequential interruption, thereby achieving key dates and milestones, and glass production at the required date or earlier.

CONCLUSION

Inspection before construction is a necessary part of the overall construction schedule and a proactive tool to assist in minimising the risk of major problems being identified at site during construction, thereby achieving key dates, milestones, the construction completion date and glass production required date without major complications.

Inspection before construction can be seen as an aid to minimising problems that may be encountered during the construction phase of a furnace build or re-build by identifying mistakes, misalignments or malfunctions at an early stage and allowing them to be rectified prior to delivery and construction.

Inspection before construction may be an additional capital cost to a furnace construction project budget, however it can help reduce the possible risk of extending the construction schedule, which in turn may result in commercial losses to the customer due to the loss of planned production days.

Inspection before construction is beneficial for the smooth running of a construction schedule with minimal unforeseen problems being experienced, and should be considered for any furnace construction project. ■

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