

Concrete Plant International North America Edition



REPRINT | CONCRETE PRODUCTS & CAST STONE

Check Points for Batching, Mixing & Curing





Pathfinder Systems, Holland, Michigan 49424, USA

Check Points for Batching, Mixing & Curing

Pathfinder Systems has 23 years of experience in concrete products manufacturing solutions. Pathfinder's service team is always working closely with its customers to keep their facilities running at peak performance. Phil Neal has been a highly valued service technician with Pathfinder for over 20 years. His long-term experience and knowledge of the concrete industry is summed up in the following article. In order for a concrete products plant to run smoothly and efficiently, there are a number of check points that need to be considered and maintained.

Raw Materials

Aggregates

As plant people, we usually do not have much choice of where our materials come from. However, it is important to at least know some basic knowledge about the supplier. For instance, what is their site like? Most suppliers use water to wash the material before being stockpiled. Are they dredging the material out of a river or lake? How large are the stockpiles? Are they well-drained? What happens to the stockpile when it rains? How do they load their trucks? These questions need to be taken into consideration and will affect plant operation. Do not leave quality and efficiency up to a truck driver or loader/operator. Care and management of the stockpiles and direct deliveries should be applied to actively control the raw material coming into the batch plant. Never put wet material into a bin that is currently being used. Do not let bins get too low. Segregation starts when bins are less than half full. Not everyone has the luxury of creating stockpiles. Large batch plant bins, covered storage and even manpower are necessary to manage this key component.

Cements

Like aggregates, one may not have a choice on what to use regarding cements but it is important to know what type it is and where it comes from. What is being delivered may not be what you were expecting. Make sure that there is plenty of reserve in case a large job comes up and a cement delivery gets delayed or even missed. Will the next load be hot because it just came out of the mill or pneumatically unloaded from a barge or rail cars? This will determine the final demand for water adjustment. As the new load filters down through the older cement, it can be 100% of the batched weight or could be 50% or some other fractional amount. The water content of the mixed batches can change, making it difficult for the operator to control the quality of the product. Blending cements to obtain colors demanded by the market is common. Therefore, white cements, slag cement, and cements that reduce a carbon footprint are becoming more prevalent in every day production.

Color

Pigments are becoming another ingredient to the daily operations of the plant. Powder, granular or liquid does not affect the end product, but each has its own set of obstacles to overcome. Inventory is imperative to completing a run.



Care and management of the stockpiles and direct deliveries should be applied to actively control the raw material coming into the batch plant.



Colored concrete products are becoming more and more popular

CONCRETE PRODUCTS & CAST STONE

Just like any colored product, the need to have enough product is essential to finish a project because the next lot will be different. The assumption that colors or color blending makes a consistent product and hides all evils. Not True! If color variations in the gray block are evident in the inventory, these variations will end up in the pigmented products. Maintain the equipment, check, calibrate and clean the scale often. Because powders and granular are delivered in sacks, attention needs to be paid to how they are lifted and stored by a forklift. Warehouse pack (long storage periods of large stacks pushed together or stacked) can cause a problem and prohibit consistent flow to the scale. Liquid pigments will usually need to be agitated or stirred in order to prevent separation of the solids from the liquid. Remember the color is measured in tenths of a pound. Just like paint colors, that tenth can make a difference in the outcome.

Admix

There are many types and manufacturers of admixes that are used in the concrete industry. Product consistency is achieved when following the manufacturer's recommendations for amount, when to add to the mixer and blending duration. Taking into consideration the doses being small a check of the dispenser ensures proper delivery. Keeping a watchful eye on inventory levels before going into the mixer will prevent the characteristics of the concrete from changing. The machine will run differently because of the change in how the molds are being filled. The end result will be product differentiation.

Water

Water should flow and maintain a set pressure from a consistent source. Potable or drinkable water is best. By knowing the source of where the water is coming from, identifying the presence of filtration or other processes will affect the supply. When the water valve gets shut off on the mixer, make sure that the flow has completely stopped. A small amount will dribble in for a few seconds afterwards but should stop. Water nozzles or openings need cleaning periodically. The cement powder will stick to the water, hydrate and over time plug up the opening.

Batching

The batching or proportioning of your concrete recipe is also key to a consistent product. Whether the material is being weighed or volumetrically measured, it is the system that needs to be kept in good operating condition. Are the gates working properly, opening and closing smoothly? Is the stream consistent across the gate or belt? Is there a presence of a moisture probe? If so, is it in the stream of material? Is the weigh batcher hanging from all the load cells equally? Is the stream of material on a volumetric feeder equal and calibrated? Keeping bins full (not sloped or below 30% full) will help control segregation. As a bin empties the material begins to flow out of the center of the bin or silo. Watch a complete batch cycle for changes and errors to what the recipe is calling for.



The batching or proportioning of your concrete recipe is also key to a consistent product.

Key in on tolerances and batch yields. Check batches from gate open to gate open to make sure it's not taking too long. This will change the filling of the molds and extend the length of the next batch. And, the problems will only get worse from there. Doing yield checks several times a shift to make sure everything is staying constant is fundamental in operational efficiency. Product weight changes can be a sign of mold wear, machine malfunctioning or even operator error.

Mixing

The mixer needs to be regularly checked and cleaned in order to inspect its components for possible maintenance issues, concentrating on the material openings, discharge gates, blades and paddles to liner. Distance increases with wear and can cause poor blending and/or problems with accurate moisture readings. Broken or missing arm guards will eventually wear down the structure. If not addressed maintenance costs will increase as well as downtime. When watching the materials flow into the mixer, does the skip hoist empty? Does the holding hopper drop all materials? Does the scale zero out or is there material sticking? If the cement does not empty quickly, is there a plug in the vent hose? Discharge openings get smaller as time goes on and if not cleaned daily will increase mixing time. Water and admix hoses and nozzles also clog over time.

Mixing duration has many factors. Some factors include type of mixer, materials used, unit weight and gravity. Even particle shape and moisture play a role in how materials blend. Once the total amout of mixing time is determined, any variation in the total mix time can cause a problem with the batching process. The goal is to have the freshest material as possible to keep up with the demand of the production machine. It takes management and routine care to produce consistent, uniform products.



Whatever curing process is being utilized, nothing is more important than paying attention to the equipment, cycle data and not allowing the moisture to evaporate too early in the cycle.

Curing

Concrete hardens through a chemical reaction between the cement powder and water. Like any chemical reaction, it is directly affected by temperature and time. What concerns the concrete products producers most is the packaging of the product so it can be put into inventory, finish the curing process and stabilize it for the end user to work with. Most plants need to accelerate curing because of space and number of production pallets available. How this is accomplished is plant specific. Some have individual rooms with steam cycles, some have one big room with atmosphere conditions using a heat source and mist, others use nothing at all. Whatever process is being utilized, nothing is more important than paying attention to the equipment, cycle data and not allowing the moisture to evaporate too early in the cycle.

Quality Control

A good QC program helps determine if all your attention to the details has paid off. Follow a complete run through from batching to the packaging while taking known samples for testing.

Follow materials through complete production cycle

- Note raw materials being used
- Watch batch as it is measured
- Mix cycle and times
- Machine settings and cycle information
- Green weight and dimensions
- Curing cycle

- Dry side handling (check for:)
 - a. Chipping
 - b. Scarring
 - c. Splitting
- Weights, dimensions and strengths

Maintenance Schedules - Divide plant into zones

- Raw materials to block/paver production machine
- Production machine (block, paver, press)
- Handling product when on pallets (green, curing, dry side)
- Packaging (splitters, tumbling, processing, cubing, strapping, wrapping)

FURTHER INFORMATION



Pathfinder Systems 695 Ottawa Beach Road Holland, Michigan 49424, USA T +1 616 395 8447 sales@pathfindersystem.com, www.pathfindersystem.com