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REPRINT | CONCRETE PIPES AND MANHOLES
The Keys to Producing High Quality Pipe



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The Keys to Producing High Quality Pipe

Around the globe, it is consistent. Improper maintenance is the number one culprit when equipment malfunctions. Poor housekeeping negatively impacts plant efficiency, pipe quality and employee morale. Lack of staff training prevents equipment from producing at maximum productivity and can make the plant environment dangerous. Proactively addressing each of these areas will greatly improve your productivity, product quality and safety while also providing a better work environment for your employees.

Form Maintenance

The production process begins and ends with molding. If forms are out of tolerance, broken or worn, it's impossible to produce a quality, high performing product. Routine maintenance is critical to daily performance of the forms and the ultimate quality and appearance of the products.

Forms are handled every day and take the brunt of the punishment. Forms are accidentally dropped and workers hit pallets and headers with various types of hammers. Every day abuses like these cause the forms to get out of tolerance and become misaligned. Forms out of tolerance produce products that are out of tolerance.

Forms should be checked for wear when the shift begins. Those not within tolerance should not be used. They should

be placed in a separate area for repair. Check that all door seams close and are flush, make sure that the lengths of two parallel sides are equal and that the mold is round to produce pipe with a desirable appearance and required specification. On three piece molds, make certain to measure all three doors prior to production. This dimension must be within 1/8" tolerance when compared to each other. The mold top and bottom seams must be even. If they are, the form is round. Visually inspect the mold skin; use your hands to feel for dents or bulges. Dents and bulges must be repaired to ensure the mold performs at the desired level. If you are working with overhead strip molds, safely measure any two sides that are 180 degrees apart.

Grease should be applied to the hinges and the pallet locks must be checked for wear. Latches must be adjusted to close the seams. No mold should ever be used unless the seams are closed. Latches are designed to roll "over center" when properly set. There should never be a need to use a secondary latch lock of any kind. Bent latches should be replaced when detected and loose latches tightened so they don't wear prematurely.

Never use broken pallets and headers. Lubricate them daily using your preferred form release to avoid breakage and damage. The industry standard stipulates that tolerance checks on pallets and headers should be performed annually.



Bent lock and latch with open mold seam latched. This must be repaired to avoid wear.



There should be grease here. The hinges are bent and worn.

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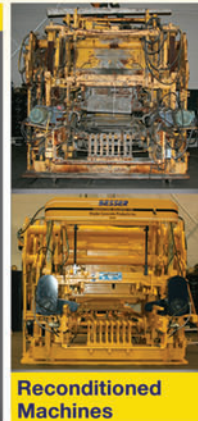
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■ Scott Kennedy learned pipe production hands on in his parents' family-owned, Besser-equipped, pipe business. Today Scott is the Technical Service Manager for the Pipe Division at Besser Company where he works with a talented team that assists pipe producers worldwide to produce the highest quality products possible using proven techniques that always put safety first. Additionally Scott instructs during the American Concrete Pipe Association's annual Pipe Production School. skennedy@besser.com

Packerhead Maintenance

It is critical that rollers and segments be kept in tolerance. As a general rule, the rollers should be adjusted to flush, or even, with the outer edge of the segments or trowels. This works best when the eccentric bushings are maintained and greased frequently using EP2 grease. The hood and the fin should be set 3/8" inside the trowel edge, and must have nice edges and chamfered tops to eliminate mechanical interference with headers, spigot formers and reinforcements.

Be sure to remove dried concrete from the rollers and frames to help balance the head. Weigh the rollers prior to assembly to make it easier to ensure the head is as balanced as possible. Balancing the head will help limit shaft wobble and shaking. The diameters of the trowels should be measured, with a diameter tape, once per week or every morning if your aggregates are abrasive. Before shimming trowels consult the manufacturers' machine operations manual and follow their instructions. Unless plant staff is properly trained in reading a diameter tape it's not recommended to shim trowels. Replacing worn trowels, those that are at the minimal allowed variance, is always the best option.

Pipe machines run on grease and oil. The oil must be kept within operational limits (90-140 degrees F degrees 32.2 - 60 degrees C). Change the filters religiously. For example, if the machine runs 10 hours + per day, 5 days per week, change



*The pallet is broken and out of tolerance.
Don't use this pallet!*

the filters once per quarter. If you operate more than this adjust the schedule accordingly. Changing filters on a regular basis will ensure pumps, motors and valves last longer which saves money. Changing filters will also maximize uptime by keeping breakdowns to a minimum.

Keep the packershaft bushings greased with high temperature grease, such as Permalube RED. This will ensure the bushings will last longer and the machine will work more efficiently day after day. Check the oil levels weekly; if there is a leak, check the level daily until the leak is repaired. Ensure that all the cooling units are free of debris.

Remember to look at the products after they are poured. Check the spigots and bells, what do they look like? All maintenance issues will show up in the products; don't wait until tomorrow to look at the products and make the necessary adjustments if needed.



The pallet ID is dirty and must be cleaned. A dirty pallet ID will cause both bell and barrel issues and will also cause segment wear.



Dirty OD of the pallet will cause excessive mold wear and bad bells. Pallets MUST be cleaned daily.



This packerhead is severely worn. The rollers, bearings, tops, hoods, wear bands and segments all must be replaced.

Packerhead Alignment

Do your bottom centering plates shift side to side or front to back? Do you have shims under them? Do you have shims under the mold? Is your top table lifting level? Does your crosshead track off the centerline and not vertically? Is your top centering plate properly adjusted? All of these adjustments must be perfect to assure alignment. If the packerhead is not aligned properly pipe will be thicker on one side and thinner on the other.

Plumbs and string lines help establish these dimensions. These items should all be checked annually or when an issue arises that can be related to alignment. Simply attach a string line to the packershafts and measure from the string to the bottom plate and top plate. Also check the bell down unit for plumb and level and that it is centered on the packershafts.



The compacted LB frame is out of balance; to remain in balance it must be cleaned daily.



The compacted rollers are out of balance. They must be cleaned and filled with foam.

The turn table should turn freely and be level. Place two plumbs on the packershaft, approximately 90 degrees apart. The dimension should be same at the bottom of the stroke as it is at the top. This ensures the shafts travel on the same plane from the bottom of the stroke to the top. If you're unsure of how to do this arrange for a trained technician to visit your plant and train your staff.

Parts

Every plant should have spare rollerhead and longbottom parts including segments, roller tops, tires, hoods and wear rings. Additionally, they should have at least one of each type of switch readily available at their facility. The use of OEM parts is recommended at all times to ensure the proper function of the machine and attachments.



Loose table hardware allows the plate to shift. The tolerance for alignment is 1/32"; this one is off by 1/2".



This bushing is worn. It needs to be replaced and a new one aligned in the machine.

Housekeeping

Worn parts, dirty machines, poorly maintained equipment, broken forms, leaking pumps and gearboxes, are conditions that occur way too often. Good housekeeping doesn't make pipe but it does allow plant staff to see all the moving parts and switches. It makes little sense to spend an hour cleaning an area before the broken part can be seen so it can be fixed. Allowing poor housekeeping tells workers to not care about the appearance of the equipment or its function.

In too many plants it has become acceptable to employ a quick fix to get through the day instead of repairing the machine the right way. Allowing the quick fix to become an acceptable solution is just a temporary band aid that will lead to larger problems in the future. It is imperative that staff take the time to repair equipment the right way. It is a small investment that pays dividends with more consistent daily opera-



This mold was dropped. It must be checked for damage before using.

tions, excellent quality production done faster and best yet, products produced in a safer work environment. Operation manuals are available from all machine manufacturers; if you don't have them, take time now to locate them online or request them from the manufacturer. Be sure to know your machine's model number when you contact the machine manufacturer. Good housekeeping instills pride in the machinery, pride in the products that are being produced and taking ownership of the equipment and its function. Managers should insist on cleanliness. A cleaner, neater workplace is also a safer workplace.

Safety

Safety is an important subject. There are different rules for safety locally and nationally. There are also different rules from company to company. Staff must always follow safety rules for



Equipment that is stored neatly allows for faster change overs, improving efficiency.



This broken switch and table race are covered in 17" of concrete, making it extremely difficult to access them. It is critical to keep your plant clean and fix equipment



High quality, aesthetically pleasing pipe are produced easily with properly maintained machinery, daily housekeeping, proper mix designs and a trained staff.

their specific facility. They should also exercise common sense. Suffice it to say, standing or sitting on the machine frame with the power on should always be avoided. Standing under a suspended load is also a situation that must always be avoided.

Too often during my career I've witnessed people not following the rules. Accidents can be prevented by strictly adhering to the plant's safety policies and employing common sense. Adhering to safety rules is a must. I share this simple safety rule as often as I can, "Come to work on time, pay attention, get the work done and go home at the end of the day healthy."

Concrete (Physics vs economics) and Steel Reinforcements (maintaining a consistent accurate cage)

Producers that have been in the industry for decades remember when concrete was simply concrete. There were minimum requirements for compressive strengths, but we paid very little attention to them. Back in the 1970s and 80s, we called our standard batched concrete a 4000 pound batch. Today, that would refer to the compressive strength. Back then it meant 800 pounds of cement, 1600 pounds of sand and 1600 pounds of stone per pound cubic yard. The compressive strength of this concrete was more than 8000 psi at 28 days. This mix produced concrete pipe that was a premier construction product. Hardy, tough and resilient. Architects, engineers and contractors preferred to use concrete pipe because it was a structure in and of itself.

Over the past two or three decades, mix designs have been changed, the "minimum" amount of cementitious material can be as low as 470 pounds per cubic yard. That's cementitious materials, not just cement. Some of these materials require the use of admixtures to help control the water to get the cementitious material to work. It's easy to blame the ma-

chine, however many production issues are the result of improper mix designs and unsuitable raw materials rather than problems with the equipment.

It's critical to use high quality materials to be able to produce high quality concrete pipe. Many plants are using expensive cements like type III or type V high early, but they're using the minimum amount. Inexpensive dirty aggregates will not produce high quality pipe. It's not possible to put enough cement in the batch to make up for dirty aggregates. Cheap and fast concrete is no good. Good concrete is not cheap or fast.

It's simple to make excellent concrete when the coarse and fine aggregates are properly blended with the right amount of cementitious material, water and chemicals. It is not magic! It's important to employ both physics and economics when developing mix designs to produce quality pipe.

Wire Reinforcement

Wire reinforcement has undergone significant changes in the same time frame. Back then, ASTM C-76 stipulated 4", 6" or 8" between longitudinal wires. Now, there only has to be enough longitudinal wires to maintain the spacing of the circumferential wires. The circumferential wires can now be as far apart as the wall thickness; in the past, the maximum was 4" and a minimum of 2".

These changes mean that we need make sure that the cages being produced are round so they create the strongest skeleton for the pipe to stand on. Plants should evaluate the distance between longitudinal wires, can be more than 13" apart now. Keep in mind, if these circumferential wires or longitudinal wires fail, the pipe is weak and it will not pass hydrostatic tests. The cage design is another choice that needs to be made using physics and economics.

Producing high quality pipe takes science, skill and the desire to produce the most elite product in the marketplace. Consult your equipment supplier for specific information on machine operation, adjustments, preventative maintenance and troubleshooting. They may also be able to conduct a plant evaluation and make recommendations for replacement parts, machine and control updates, changes to mix designs and provide training for your staff. Training is also available from the American Concrete Pipe Association. Consult concretepipe.org for specific details and dates. ■

FURTHER INFORMATION



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