

BUCKET ELEVATOR INSPECTION



Periodic inspections of bucket elevators should be an essential part of any maintenance program. Often it is helpful to conduct these with a trusted vendor who can provide insight into solutions that go beyond just part replacement. The following are examples of common issues found during bucket elevator inspection programs conducted by 4B Components USA. This paper will provide suggestions on what to look for and explain the consequences of each issue.

Issue #1 - Worn / Loose Slide Lagging

The rubber surface on this head pulley's slide lagging has worn away and also a section of the lagging has come loose and is in danger of scraping the casing which can create heat and sparks. In addition, the reduced contact between the pulley surface and the belt can cause the belt to slip under load which will also lead to heat. Either of these heat sources could ignite a dust cloud inside the elevator, resulting in an explosion. Finally, if a perforation is worn into the casing dust can escape, and an extensive hot work repair will be required.

To help with early indication of these types of issues the installation of a speed switch on the tail shaft can sound an alarm and provide automatic shutdown before a dangerous belt split condition persists. Also a correctly positioned misalignment switch can detect a misaligned belt, a misaligned pulley or a piece of lagging that has come loose. These sensors can both alarm or shut down the bucket elevator so that corrective repairs can take place.



Loose Lagging



Misalignment Outside



Misalignment Inside



Touchswitch™
Belt and Pulley
Misalignment Sensor



Whirligig®
Speed Switch

Issue #2 - Broken Buckets

No matter the precautions taken, tramp material such as rocks, metal wrenches and wood boards can find their way into bucket elevators. The impact of these foreign objects in the product stream takes a toll and can result in broken buckets. Impacts can also knock buckets loose from the belt, diminishing throughput and could actually cause a plug condition. Screens and magnets located at the inlet can help capture tramp material before it enters the elevator. And plug sensors can help to detect a blocked chute. Also, heavier duty elevator buckets with stronger front lips can withstand more impact than lighter duty.



Broken Elevator Buckets



Jumbo Heavy Duty
Elevator Bucket



Auto-Set™ Flush Probe
Plug Switch

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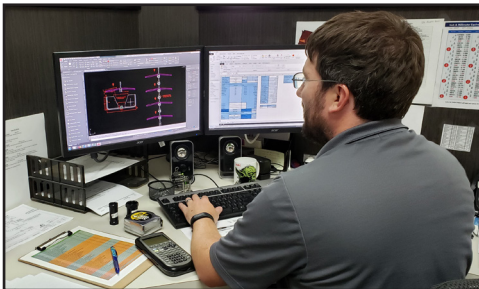
Issue #3 - Excessive Bucket Wear

Aside from broken buckets, prematurely worn buckets can diminish throughput and make discharge inefficient. Another consequence could be early discharge resulting in material falling back down the upside of the elevator leg also known as back-legging. Back-legging just adds to the problem of premature wear because additional material ends up in the boot and the buckets must dig through it, wearing them further. Causes of this type could include an under tensioned belt, improper belt speed, excessive digging or material buildup in the boot, or the wrong style of elevator bucket being installed.

If the material being elevated is too abrasive for the bucket resin being used, employing digger buckets or changing to nylon or polyurethane buckets may help. 4B Components' engineering group can assist with these issues along with any corrections to the elevator leg design, belt speed and bucket spacing.



Elevator Buckets with Extensive Wear



4B Engineering



CCS Nylon Digger Bucket



Steel Digger Bucket

Issue #4 - Loose Sprocket on Head Shaft

The head sprocket on this continuous discharge chain bucket elevator came loose from the shaft because the set screw in the keyway failed. The sprocket wandered and the buckets eventually scraped the casing. Here again is metal-on-metal friction. Aside from wearing the buckets prematurely, this friction is a heat source that could lead to a dust explosion.

The installation of an extended range proximity switch on each side of the leg casing can sound an alarm when the chain moves over and can automatically shut down the elevator if the condition persists.



WDA Extended Range Proximity Sensor



Steel Bucket Rubbing Against the Elevator Casing

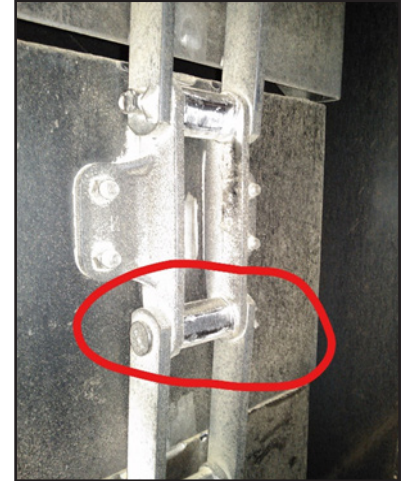
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Issue #5 - Chain Wear

In a similar continuous chain bucket elevator, the chain barrels are starting to flatten as can be seen circled in the image to the right. This indicates possible chain stretch and / or improper meshing with the sprockets. The chain is wearing prematurely, or stretching, and impeding the efficient function of the entire system.

Periodically inspect the chain barrels and chain for excessive wear, cuts, grooves, or flat spots. Chain barrel wear results in “hooked” sprocket teeth which accelerates chain wear so it is important to also inspect the sprockets.



Issue #6 - Loose Fasteners

The nuts and lock washers that secure elevator bolt fastening systems can come loose. Inattention during installation and the constant vibrations of the elevator can work these items loose. This is the reason equipment manufacturers recommend the regular tightening of elevator bolts throughout the life of the bucket elevator. No one wants an elevator bucket to become detached and cause damage.

One solution to this problem is the use of fanged style elevator bolts in conjunction with a nylon insert lock nut (nylock). The fangs bite into the belt cover and prevent the bolt from rotating as a nylock nut is applied. Once in place, it is less likely that the nylock nut will back off due to system vibration. Another solution is the installation of an “EASIFIT” Elevator bolt. These specialty bolts incorporate a hex at the end of the bolt which locates into a special tool in order to stop the bolt from turning when a Nylock nut is installed.



*Fanged Elevator Bolt
with Fender Washer and
Nylock Nut*



*Easifit
Elevator Bolt*



*Easifit Pneumatic
Air Ratchet Tool*

In this article we have shared six common problems identified during 4B bucket elevator inspections. Many other issues can arise and our team of bucket elevator specialists is qualified to inspect and provide solutions to help bring your bucket elevator back to its optimum performance. Call us at 309-698-5611 to book your bucket elevator inspection.