Stop the Failure Cycle

Practical Reliability Through Prep, Clean, Lube, Protect.

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Table of Contents

Acknowledgements

This guide is the result of many years spent inside industrial facilities, working alongside the people responsible for keeping equipment running. The lessons in these chapters did not come from theory. They came from production floors, maintenance shops, and long conversations next to equipment that had either just failed or had finally stopped failing.

I've had the opportunity to work with maintenance technicians, mechanics, engineers, and reliability leaders across a wide range of industries. In every facility, I saw similar patterns. The people closest to the equipment understood its behavior better than anyone. They could hear when something was beginning to change. They could see when protection was starting to break down. Their experience shaped my understanding of what causes equipment to last and what causes it to fail.

Many of the examples in this guide are based on real situations I witnessed firsthand. Facilities dealing with repeated chain failures, seized fasteners, electrical faults, and downtime that had become accepted as normal. In many cases, the equipment itself was not the problem. Once the focus shifted to prepping, cleaning, lubrication, and protecting, the failures stopped. Seeing those changes occur reinforced a simple truth: reliability is not accidental. It is created through consistent intentional protection.

I am grateful to the maintenance professionals who took the time to explain their challenges, test new approaches, and share their results. Their willingness to improve their processes made this guide possible.

I also want to acknowledge the people who perform this work every day. Maintenance is often invisible when it is done well. Equipment runs, production continues, and no one notices. But that reliability exists because someone took the time to protect it.

Executive Summary

If you manage or maintain industrial equipment, you've likely experienced the frustration of a machine that "just broke down" for no apparent reason. In the real world, however, equipment failures are rarely random – they frequently result from a breakdown in routine maintenance or loss of protective measures over time. This white paper explores how recurring equipment failures (the "failure cycle") can be prevented by adopting a proactive maintenance approach we call "Prep, Clean, Lube, Protect." Each step targets a specific failure cause: preparing parts properly (for example, using effective penetrants to free stuck components), thorough cleaning to remove contaminants, applying the right lubricants to reduce wear, and protecting surfaces from corrosion and other damage.

These aren't just theories – the paper shares real-world case studies [1] where maintenance teams broke out of their failure cycles. For instance, a manufacturing plant eliminated weekly CNC machine breakdowns and reportedly saved over $100,000 per year by improving cleaning and lubrication on a critical component (see Case Study A). A beverage facility switched to a precise NSF H1 food-grade penetrant and saw a 15% reduction in lubricant use and ~50% lower unit cost, translating to more than 60% total savings for that application (Case Study B). And a large egg farm used a high-adhesion lubricant on dusty conveyor chains and stretched re-lube intervals from daily to every 7 weeks, completely stopping chronic chain breakages and saving an estimated $20,000 annually (Case Study D). These examples demonstrate that investing time in "Prep, Clean, Lube, Protect" not only prevents breakdowns but also delivers ROI through less downtime, longer equipment life, and lower maintenance costs.

Equally important, in regulated industries like food processing, this approach helps ensure compliance with USDA/FDA requirements (such as using only food-grade lubricants where required by 21 CFR 178.3570) while still achieving top performance. By focusing on proactive protection instead of reactive fixes, maintenance teams can transform their daily grind, seeing fewer emergencies and more reliable operations. In short, reliability isn't luck – it's built one maintenance step at a time.

Chapter 1: Equipment Failure Is Not Random

We've all heard it on the shop floor: "I don't get it – the machine just failed out of nowhere." At 2 AM, when a line is down, it indeed feels like failures strike at random. But if you've been in maintenance long enough, you know that machines usually give plenty of warning signs before they die. Failures have roots. A bearing runs dry because lubrication intervals slipped. An electrical board shorts out because moisture seeped in over time. A gearbox fails because contamination turned its oil into grinding paste. In other words, what seems like a sudden breakdown is often the final stage of a problem that's been silently brewing.

[1] Disclaimer: The case studies and testimonials in this paper are drawn from individual customer experiences. Your results may vary based on factors unique to your facility. All performance improvements, cost savings, and similar results are as reported by those customers; they are used here with permission to illustrate potential outcomes, not to guarantee specific results. In each case, WD-40 Company provided complimentary product samples for the customers' evaluation, but no payments or other compensation were given for their feedback.

Consider the story of a CNC machine at a metal fabrication shop (Case Study A). This machine's sliding way covers kept sticking due to dried coolant and debris build-up, which caused the machine's doors to jam and triggered faults that shut down the machine. The downtime was over an hour each week – expensive and frustrating. It's easy to blame the machine for "randomly" acting up, but a closer look revealed the real issue: the way covers weren't being cleaned and lubricated properly. The crew had been using a basic lube that washed away quickly in the presence of coolant and aluminum dust. Without a lasting lubricant film, the sliding covers would bind.

Once the team identified this root cause, they changed tactics. They cleaned off the gummy residue and switched to a more durable lubricant (in this case, a heavy-duty white lithium grease that clings well). Instantly, the weekly jams stopped. According to the maintenance manager, the CNC doors started operating smoothly and no further failures occurred after the change. By eliminating that recurring downtime, the shop saved an estimated $1,600 in production loss and $350 in labor *every week* – over $100,000 a year (Case Study A). What felt like an unpredictable failure was actually a preventable maintenance issue all along.

The takeaway: Equipment doesn't fail for no reason. There's always a cause, whether it's obvious or hidden under grime. Our job in maintenance is to find and fix those underlying issues. The best way to do that is to get ahead of them with a systematic, preventative approach that ensures machines are prepared, clean, well-lubricated, and protected from damage. The rest of this paper breaks down that approach, step by step, with real examples showing its impact. As you read, think about the "mystery failures" in your own facility – chances are, they'll start to make sense in the context of these common pitfalls.

Chapter 2: Common Lubrication Mistakes – and Their Consequences

Lubrication is one of the most fundamental maintenance tasks, yet it's easy to get wrong. When lubrication isn't done right, components wear out faster – sometimes faster than anyone expects. Three common mistakes often contribute to the failure cycle:

- Using the Wrong Type of Lubricant: Just like you wouldn't use engine oil in a gearbox or vice versa, each application demands the right product. But in practice, people sometimes grab whatever's handy. Use a grease that's too light for a heavy-load bearing, and it'll squeeze out or break down, leaving metal-on-metal contact. Use an oil that's too thick for a fast-moving chain, and it may not penetrate into the pins, effectively leaving the critical areas dry. One subtle example is in food processing plants: using a general-purpose (H2) oil on a food-packaging machine is a double whammy – it's not only likely to fling off and fail to lubricate, but it also violates food safety rules. In all these cases, the equipment is left under-protected, and failure is just a matter of time.
- Poor Application – Not Hitting the Right Spot: Another big culprit is the way lubrication is applied. You can have the best lubricant in the world, but if it doesn't actually reach the components that need it, you're no better off. We see this often with aerosol sprays where the spray can't be directed properly into a small opening. Maintenance techs end up

"painting" the outside of a part with lube, but inside, the part is bone dry. Or consider greasing through a blocked fitting: if grease can't get in, the bearing starves and fails despite your grease gun showing pressure. An example from Case Study B: A beverage plant had a tough time reaching a conveyor chain inside a gearbox because the only access was a tiny port. They used a spray lube with a flimsy removable straw – which often went missing – so oil was sprayed in the general area, but not deep onto the chain links. The chain was effectively under-lubricated, even though they were "lubricating" it regularly. We'll revisit this case in detail later, but the fix involved a better application method (an integrated straw that never gets lost) and the right product for the job. The takeaway: method matters. Always ensure your lubrication tool or technique actually delivers lube to the needed surface.

- Ignoring Food-Grade Requirements: In facilities where product safety is paramount (food, beverage, pharma), using non-food-grade lubricants in or near production areas is a serious mistake. Not only does it risk contaminating your product (a single drop of non-food-grade oil in food can render it adulterated and illegal to sell), but it can get your facility in trouble with regulators. The FDA and USDA have zero tolerance on this issue – hence the requirement for food-grade (NSF H1) lubricants for any machinery that might incidentally contact food or packaging. Modern maintenance professionals should be well-versed in these rules (21 CFR 178.3570 spells out what's allowed in H1 lubricants). Fortunately, as we'll discuss, there are now food-safe products for almost every lubrication need, so you never have to "cheat" on compliance to get the job done. For example, WD-40 Specialist offers an NSF H1 Lubricant & Penetrant that a beverage plant used to replace their old H2 spray – and they found it worked just as well while keeping them inspection-ready (Case Study B). So the old excuse that "food-grade stuff doesn't work as well" is no longer valid. You can have performance *and* compliance.

Each of these mistakes creates the same outcome: a part of your machine that you thought was lubricated really isn't, either due to product failure or application failure. That part will start to wear out, overheat, or seize, and eventually you get a breakdown that "shocks" everyone. By choosing the correct lubricant and applying it in the right way (and with the right frequency, as we'll cover later), you maintain the protective film that stands between smooth operation and a ruined component.

Chapter 3: Cleaning – Where Protection Actually Begins

A lot of preventable failures start with poor cleaning practices. Let's be honest: cleaning can be a thankless job. When production is breathing down your neck to resume operation, spending extra time to clean equipment thoroughly might not seem urgent. But skipping cleaning is like building on quicksand – any lubrication or protective measure you add on top of dirt and gunk isn't going to hold up.

In dusty or sticky environments, cleaning becomes even more critical. A layer of dirt can turn even the best grease into an abrasive sludge (imagine the mixture of dust and oil acting like sandpaper

on your components). A classic example comes from Case Study C, involving an irrigation tubing manufacturer. Their automated coiling machines were regularly jamming and blowing bearings. The root cause? The cleaning agent they used left a slight residue, which trapped dust and plastic particles. In essence, every time they "cleaned," they were leaving behind a sticky film that created a new dirt-attracting layer.

So, the team switched to a fast-drying, residue-free degreaser and made sure to wipe components completely clean before re-lubricating. The difference was night and day: the coilers ran smoothly and unplanned stoppages dropped to zero. Over a year, the manufacturer saved an estimated $24,000 by avoiding those downtime incidents and reducing bearing replacements (Case Study C). The maintenance engineer described the new cleaning process as a *"game-changer"* – no more gummy buildup, meaning no more dragged-down bearings or surprise jams.

The lesson: clean first, and clean properly. Use the right cleaner for the job (sometimes that's a heavy-duty solvent, other times a simple wipe-down will do, but always ensure the cleaner itself doesn't leave residues). In food processing, cleaning has the added step of making sure any chemicals used are food-safe and rinsed off if they contact food surfaces. A lubricant or sanitizer can actually become a contaminant if it's not food-grade and not removed. So, whether it's flour dust around a bakery line or metal shavings on a lathe, cleaning is the foundation of effective lubrication and maintenance. It sets the stage for everything that comes next.

Chapter 4: Selecting the Right Lubricant – Getting "Lube vs. Load" Right

When it comes to lubrication, one size definitely does not fit all. The best lubricant choice depends on the specifics of your equipment and its operating conditions. If you mismatch the lubricant to the application, you could be unknowingly aiding the failure process.

Imagine, for example, a high-speed chain drive in a packaging machine. If you slather on a very thick grease thinking it'll protect better, you might actually starve the chain's moving parts of lubrication. The grease could sit on the outside of the chain and never penetrate into the pins and bushings where metal-to-metal contact is happening. In a dusty environment, that thick grease on the outside can mix with dirt to form an abrasive paste, which starts grinding away at the chain. In contrast, a lighter chain oil or penetrating lubricant, designed to wick into tight spaces and carry anti-wear additives, would keep those internal surfaces coated. We've seen scenarios where simply switching from a heavy grease to a penetrating chain lube makes a huge difference – suddenly chains stop stretching and wearing out, and the drive motors even run cooler because the friction is reduced.

On the flip side, consider a slow-moving, heavily loaded bearing (like the pivot on a big conveyor or mixer). A light oil would run off too quickly, offering only brief protection. Here you'd want a high viscosity grease, maybe even with tackifiers (sticky additives) or solid lubricants, to ensure it stays in place under pressure. This was the case at a construction materials plant where the pivot bearings on a gravel conveyor kept failing. The team realized the thin oil they used was getting squeezed out almost immediately, so they weren't truly lubricating the bearing! When they

switched to a heavy-grade grease with extreme pressure additives, the bearings started lasting significantly longer.

The key point: match the lubricant to the job. Consult equipment manuals for recommendations, and don't be afraid to ask lubricant suppliers for advice or to try a sample. And always remember any special constraints – for example, in a food plant, your "palette" of choices is limited to food-safe formulas for anything near product zones. Thankfully, nowadays you can find an NSF H1-registered version of just about every lubricant type (gear oil, hydraulic fluid, greases, penetrating oils, etc.), so you can comply with food safety rules without sacrificing protection. In short, using the right lubricant, one that's engineered for your specific wear points and environment, means you won't have to constantly reapply or deal with recurring failures. It's a preventative fix that pays off quickly.

Chapter 5: Chains and Conveyors – The "Canary in the Coal Mine" for Lube Problems

If there's one place where lubrication issues show up early and often, it's on chains and conveyors. These systems are like the canary in the coal mine for maintenance troubles: they're out in the open, dealing with dust, high loads, and constant motion. If your lube program has a weakness, your chains will likely tell you first – through squeaks, jerks, visible rust, or outright failures.

We already touched on the egg farm case where daily lubrication couldn't prevent chain failures (Case Study D). Let's dig a bit deeper into what was happening there: Every day, the maintenance crew doused those manure conveyor chains with oil, but the environment was so harsh (dust, manure, heavy loads) that by midday, most of that oil was gone. What little remained had mixed with dirt and essentially created an abrasive sludge, actually accelerating the wear. The chains stretched and snapped because they were practically running dry between those daily lube rounds. It's a classic case of a good frequency (daily sounds great, right?) being undermined by a poor lubricant choice and harsh conditions.

When the farm switched to the tacky gel lubricant that stayed put, it was a game-changer. The new lubricant clung to the chains through all the dust and movement, meaning the pins and bushings were continuously protected. That's why they could extend lubrication to every 7 weeks – the lube was still there doing its job in week 6, whereas the old oil was gone in hours. And because the chains were finally getting consistent lubrication, their wear went way down and breakages stopped entirely. Think about that: from 55 broken chains a month to zero. That isn't luck; that's cause and effect. Proper lubrication can have that kind of impact.

For anyone running conveyors or drive chains, the egg farm story might sound familiar. The takeaway is, listen to your chains. If they're making noise, leaving red dust (a sign of rust), or constantly needing take-up adjustments, something's off with your lubrication program. It might be the wrong lube, the wrong amount, or the wrong interval – often it's all three. The good news is that dialing in the right lube strategy for chains can yield quick wins. You'll get quieter operation (a well-lubricated chain is a quiet chain), fewer motor overloads, and far fewer chain replacements. And if your chains are in a food plant, remember: use food-grade chain lubricants for any chain near

product zones. There are H1-approved chain lubes that can handle high temperatures (for oven chains) or are solvent carriers leaving dry films for minimal residue. In other words, no excuses – you can take care of your chains and still pass that food safety audit.

Chapter 6: Don't Forget the Small Stuff – Electrical and Other Overlooked Failures

Not every failure is a seized bearing or a thrown chain. Some of the trickiest, most maddening downtime causes are electrical or small mechanical issues that stem from things like corrosion, dirt, or dry tiny components. These don't always get the same attention in maintenance routines, because they're not as obvious as greasing a bearing or oiling a chain. But they deserve love too, or they can trigger big problems.

Take electrical connectors and sensors. In a washdown area of a food plant, you might have watertight connectors that still, over time, get moisture inside or develop corrosion on the pins. One day a sensor starts giving erratic readings, and the equipment goes haywire. I recall a case where a packaging line's photo-eye sensor kept shutting everything down. We discovered a fine white crust on the connector – basically, corrosion from moisture exposure. A quick cleanup with a proper electronics cleaner (and a dab of dielectric grease for good measure) solved it. The intermittent fault never returned. It's a reminder that a bit of preventive care on electrical parts (like periodically inspecting and cleaning connectors, or blowing out control panels with dry air – with the power safely off, of course) can ward off those "weird" failures that are hard to troubleshoot at 3 AM.

Even small mechanical parts like springs, linkages, and guide rails can cause headaches if they rust or get gummed up. A tiny broken return spring on a palletizer can halt an entire line. A sticky solenoid or air cylinder can cause misfeeds and jams. The fix is usually simple: clean it, lube it, or replace a cheap part – but you have to notice it *before* it stops everything. That's why a good maintenance program includes regular check-ups for more than just the big obvious components. Many technicians I know do a weekly walkaround with a rag and a can of light lubricant or rust inhibitor, just wiping down small movable parts and joints. It's a great habit. It keeps things clean, leaves a thin film of protection, and you often spot developing issues (like a frayed cable or a loose bolt) in the process. These "small" actions can prevent big downtime events.

(Side note for food industry readers: If you're doing this kind of touch-up lubrication or cleaning around food equipment, stick to NSF H1 aerosols or food-safe wipes. You don't want to accidentally introduce a non-food-grade substance while attending to that little sensor or hinge inside a food packing machine. Always think: if this could touch the product or product surface, it needs to be food-grade.)

Chapter 7: Corrosion – The Silent Equipment Killer

Corrosion is like a slow cancer for machinery. You might not notice it day to day, but it's steadily eating away at metal surfaces, undermining structural integrity and seizing up moving parts. By the

time corrosion causes a failure – a rusted shaft snapping or a frozen valve – the damage is already done. That's why early corrosion protection is key.

If you've ever pulled a steel part out of service and found it rusted or pitted, you know that sinking feeling: "We should have greased this" or "Why didn't we spray it with something before storing it?" The good news is preventing corrosion is usually straightforward. There are plenty of corrosion-inhibiting sprays and coatings out there. Some are oily, some dry to a waxy film, and some are even FDA-approved for incidental food contact. The trick is to include corrosion protection in your maintenance routine. For instance, after you finish cleaning and lubing a mechanism, ask: do any parts need a light coat of rust protectant? This is especially important if equipment sits idle for stretches of time or is exposed to water or chemicals.

We saw the benefits of corrosion prevention in the wind farm case (Case Study E). Technicians there incorporated a penetrating lubricant that not only freed stuck bolts quickly but also left a protective film to ward off future rust. By doing so each time they serviced certain turbine components, they found those parts stayed in better shape between major overhauls. The operations manager noted that using the right penetrant cut the time to loosen corroded bolts from an hour to just minutes – a huge help when you're 300 feet up in a turbine nacelle (Case Study E). By fighting corrosion proactively, they saved an estimated $16,000 in labor annually and spared their techs a lot of aggravation. The broader point: whether it's a giant wind turbine or a small pump in your plant, keeping corrosion at bay will pay you back with fewer failures and easier maintenance. A little spray now can save a lot of wrenching later.

Chapter 8: Finding the Right Lubrication Frequency

"How often should I grease this?" – It's a question every maintenance team grapples with. Lubrication frequency isn't one-size-fits-all. The goal is simple: keep a continuous film of lubricant on the part. The reality is more complex, since that film's life depends on load, speed, temperature, environment, and the lubricant's properties.

A lot of sites default to a time-based schedule (e.g., "grease weekly" or "oil daily"). That's a good starting point, but it may not be optimal. Some parts might need attention *more* often than you think (especially if using an OK-but-not-great lubricant or if the machine is in a nasty environment). Other parts could go much longer than you expect, particularly if you use a high-performance lube that sticks around.

The key is to observe and adjust. If you see fresh grease purging out of a bearing every time you service it, you might be greasing too often or too much – you're wasting product and could even be causing heat buildup from over-greasing. On the other hand, if you find a component is often dry or the lubricant looks burnt between scheduled services, you need to shorten the interval or improve the product. Modern tools like vibration sensors or thermal cameras can alert you to components running dry (spikes in vibration or heat), but even simple inspections work: a quick touch (with appropriate safety precautions) or sound check can tell you a lot about whether a part is getting the lube it needs.

The egg farm conveyor example (Case Study D) is a dramatic reminder of how getting frequency right (in combination with product choice) makes all the difference. They went from oiling those chains every day (and still having failures) to greasing every 50 days (with no failures). No magic – the new lubricant just lasted much longer. In general, if you find yourself saying, "I just lubricated that darn thing and it's already squeaking/breaking," that's a flag to re-examine both what you're using and how often. Conversely, if a new lubricant allows you to safely extend intervals (like in the egg farm case), that's a huge win for productivity – just be sure to monitor performance to ensure the new interval truly holds up.

Lastly, always document any changes to lubrication frequency and keep tabs on the results. If you extend an interval, watch that asset closely for a while. If you shorten an interval due to issues, see if the problems abate. Over time, you'll dial in frequencies that keep everything running smoothly without wasted effort. And remember, any changes in operating conditions (load, hours of operation, etc.) might require revisiting those intervals. Lubrication schedules aren't "set it and forget it" – they evolve with your operation.

Chapter 9: Application Methods – Delivering Lubrication Where It Counts

Using the right lubricant on the right schedule still won't help if the lubricant doesn't actually make it to the critical surfaces. I can't stress this enough: application method matters. We touched on this under common mistakes, but let's give it a bit more attention from a hands-on perspective.

One common scenario: aerosol sprays. They're convenient, but if you can't aim them correctly, you'll end up lubricating the air (or your face) more than the part. We've all chased those little red straws that fall off the can and disappear. Without the straw, you're often blasting a wide spray, hoping some of it lands where it needs to. In tight or recessed areas, that's a recipe for under-lubrication. The beverage plant's gearbox story (Case Study B) was a classic example: because they couldn't reliably snake a straw into the lube port, much of the oil just hit the cover interior and never even touched the chain. It's like spraying paint on a wall with half the paint missing the target – looks like you did something, but the coverage is poor.

The solution can be as simple as improving the applicator. In the beverage facility, WD-40's Smart Straw® (the permanently attached straw that flips up) was a small innovation that made a big difference. With it, the maintenance tech could direct a precise stream of food-grade penetrant right onto the chain, even inside a cramped gearbox. That meant no excess mess and a properly lubricated chain. The change immediately cut down on waste (they needed about 15% less lubricant overall) and since the WD-40 Food-Grade Penetrant was less expensive per unit than their previous product, they saved nearly 50% on cost per can. Combined, those benefits added up to roughly 65% reduction in total lubrication cost for that task (Case Study B). But equally important, the job became easier and more predictable – no more half-hour struggles to jury-rig a spray straw and clean up overspray.

The lesson here is mirrored in many maintenance shops: when you're fighting with how to apply a product, don't blame the maintenance tech – look at getting a better tool. This could mean using a different form of the product (grease cartridge vs. spray, for instance), or accessories like extension

wands, or products specifically designed for tricky spots (like foaming penetrants that expand into gaps). A little creativity and the right tools will ensure that the lubricant goes *in* the bearing, on *the* chain, or into *the* joint – not on everything around it. Again, remember to stick with food-grade application methods when in a food plant. For instance, if you need to use an automatic oiler on a food conveyor, the oil it dispenses must be H1. These details matter to auditors and inspectors, and it's a lot easier to integrate compliance from the start than to defend a questionable practice later.

Chapter 10: Building Reliability – From Reactive to Proactive

When you're constantly firefighting breakdowns, it's hard to imagine having a calm, controlled maintenance routine. But shifting from reactive to proactive maintenance is not only possible – it's happening on shop floors right now, with great results. The approach outlined in this paper – Prepare, Clean, Lubricate, Protect – is essentially about covering all the bases of equipment care. When you do that, you address the causes of failure before they wreak havoc. Over time, fewer things go wrong unexpectedly. You start to trust that your machines will make it to the next scheduled service without drama.

Let's revisit a broader example that ties it all together: an automotive parts manufacturer that overhauled its maintenance program (Case Study F). This facility was losing time and money to a scattershot maintenance approach – technicians had a mishmash of products and homegrown procedures, and results were hit-or-miss. They decided to streamline and upgrade their practices using the four-step "Prep, Clean, Lube, Protect" model with a suite of WD-40 Specialist products. The transformation was significant:

- They cut certain cleaning tasks in half (one mechanic said he used to spend ages degreasing equipment, but the new degreaser got the job done in one or two passes instead of four).
- Using a superior penetrant on assembly fixtures shaved off 50% of the wait time to loosen stuck parts, speeding up changeovers.
- By switching to longer-lasting lubricants, they trimmed overall lubricant consumption by about 20% in some areas (less reapplication needed).
- With everything running more smoothly, they observed a tangible drop in emergency breakdowns.

By the end of the first year, the plant tallied up roughly $12,000 in maintenance cost savings (Case Study F). Just as importantly, the maintenance crew noticed a cultural change: instead of dreading which machine would act up next, they took pride in staying ahead of issues. One supervisor commented that maintenance had become more predictable and less chaotic – exactly what you want.

If you're a maintenance professional, these outcomes might sound almost too good to be true. But they came from real, on-the-floor changes, not from expensive new machines or hiring an army of technicians. The facilities simply optimized what they were doing: better products, better methods, better discipline in routine tasks. The white paper's case studies (see Appendices A–F) are proof

that when you focus on protecting equipment rather than just reacting to failures, you can break the old cycle. It won't happen overnight – it takes some upfront effort to implement new practices and maybe a bit of investment in upgraded supplies or training. However, the payoff in uptime, cost savings, and sanity is well worth it.

Conclusion

Reliability is built day by day. Every time you prepare a rusted part properly, clean a machine thoroughly, lubricate it with the right product at the right interval, and shield it from corrosion, you're stacking the deck in favor of uptime. Over weeks and months, those actions accumulate into a new pattern – one where machines run the way they're supposed to, and where you spend your time on planned improvements instead of emergency repairs. Breaking the failure cycle isn't easy, but as the stories here show, it's absolutely achievable with practical steps. And as a bonus, in regulated sectors, these same steps ensure you're meeting safety and compliance obligations (for example, using only NSF H1 lubricants in food zones, keeping cleaning chemicals food-safe, etc.), making audits one less thing to worry about.

From one maintenance professional to another: the power to improve reliability is in your hands – literally, in the rags, grease guns, and spray cans you use every day. Use them wisely, and you'll keep your equipment running stronger, longer.

Appendix - Case Study A

CASE STUDY

WD-40 SPECIALIST® SOLVES CNC MACHINE DOWNTIME PROBLEM, RESULTING IN ESTIMATED ANNUAL SAVINGS OF OVER $100,000

CUSTOMER CHALLENGE

Company Overview: We provided complimentary test samples of WD-40 Specialist White Lithium Grease and Industrial-Strength Degreaser for evaluation by a leading U.S.- based manufacturer of aluminum forms used in cast-in-place concrete wall systems. Their solutions are trusted by contractors worldwide for high-rise buildings, foundations, and custom concrete wall applications.

The Challenge: At the customer's manufacturing facility, CNC machines are essential in shaping and forming aluminum components. A consistent pain point was maintaining the CNC way covers—critical components protecting internal machinery. When not properly lubricated, they became sticky from coolant and debris, causing doors to jam and machines to fault. According to the customer's maintenance manager, downtime typically lasted at least an hour and cost approximately $1,600 in lost production each occurrence, plus $350 in maintenance labor. Averaging 1 machine down per week. Their previous approach involved applying a competitor's lubricant—a process that was expensive and messy, reportedly requiring up to eight applications a month.

We asked the manufacturer to try out our products and then interviewed its maintenance manager about the results.

CUSTOMER-REPORTED RESULTS

The Solution: The customer switched to the WD-40 Specialist® Industrial-Strength Degreaser to clean away the sticky buildup, followed by an application of WD-40 Specialist® White Lithium Grease to maintain long-lasting lubrication.

Reported Results:

- Reduced Maintenance Effort: Lubrication needs dropped from 8x/month to just 1x/month.
- Cleaner Operation: No more residue issues from old lubricants and coolant buildup.
- Reliable Equipment Performance: CNC doors operate smoothly with no machine-fault interruptions.
- Customer-Estimated Cost Savings: $1,600/week in prevented production loss & $350/week in reduced maintenance labor

Total customer-estimated savings: $101,400 annually

WD-40® Brand Solution

WD-40 Specialist White Lithium Grease
WD-40 Specialist Industrial Degreaser

Testimonial

WD-40 Specialist Products used by the Maintenance Manager.

"You have to try it. IT WORKS."

Appendix - Case Study B

CASE STUDY

WD-40 FOOD-GRADE ESTIMATED TO REDUCE LUBRICANT USAGE AND COST BY 20% AND 50% RESPECTIVELY IN BEVERAGE MANUFACTURING

CUSTOMER CHALLENGE

Company Overview: WD-40 Specialist® provided test samples of their Food-Grade Lubricant & Penetrant to a central Ohio-based beverage manufacturer and supplier operating a fully integrated facility. The site manages the entire process in-house, including bottle preform and blow molding, cap manufacturing, soda blending and filling, bag and boxing, canning, bottling, and in-house printing for labels, fleet decals, and sales signage.

The Challenge: According to the Company, the facility experienced challenges lubricating chains inside enclosed gearboxes that drive conveyor shaft belts across bag and box, can, and bottle operations on the filling and canning line. Each gearbox includes a protective cover with only a small access port for lubrication.

The prior incumbent lubricant required a manually attached straw, making accurate application difficult in confined spaces. Straws were misplaced, leading to imprecise spray patterns, excess product use, and increased lubricant fling once the chain returned to operation. The result was higher product consumption, inconsistent application, and unnecessary waste.

Customer-Reported Results

The Solution: The facility converted to WD-40 Specialist® Food-Grade Lubricant & Penetrant, leveraging the attached 2-Way Smart Straw® to apply lubricant precisely through the small access opening without losing the straw or over spraying. The product's controlled spray pattern improved targeting of the chain inside the gearbox while maintaining food-grade compliance for use within the beverage processing environment.

Customer-Reported Results: Based on interviews with company personnel, switching to WD-40 Specialist resulted in:

- 20% reduction in annual lubricant consumption due to more precise application and reduced fling
- 56% reduction in purchase cost per unit (based on estimated Specialist product cost provided by WD-40 Company to the facility).
- Improved consistency and ease of maintenance for enclosed chain lubrication points

65% Total Estimated Application Savings

WD-40® Brand Solution

WD-40 Specialist Food-Grade Lubricant & Penetrant

Testimonial from a Facility Maintenance Employee:

WD-40 Food-Grade Products used by Maintenance.

"This doesn't fling nearly as much as much, we can spray it right where we need it, and it cost half the price."

Appendix - Case Study C

WD-40 SPECIALIST® INDUSTRIAL STRENGTH DEGREASER ESTIMATED TO SAVE TUBING MANUFACTURER $24,000 ANNUALLY

CASE STUDY

CUSTOMER CHALLENGE

Company Overview: A leading global manufacturer of drip irrigation lines, tubing, and related agricultural landscaping products whose products play a vital role in agricultural production worldwide, ensuring efficient water delivery for farms and landscaping.

The manufacturing facility faced persistent equipment performance issues due to the buildup of grease, dirt, and grime on their coilers—critical machines responsible for coiling their finished product. According to the company, the previous degreaser it used left a sticky residue that attracted airborne particulates, causing:

- Increased downtime from coiler binding
- Bearing failures due to dirt accumulation
- Increased labor and maintenance costs
- Wasted product due to machine inefficiencies.

WD-40® Brand Solution

WD-40 Specialist Industrial Strength Degreaser

We supplied the manufacturer with a complimentary sample of WD-40 Specialist Industrial-Strength Degreaser for evaluate on and interviewed its maintenance engineer about the results.

CUSTOMER-REPORTED RESULTS

The manufacturer converted to WD-40 Specialist Industrial-Strength Degreaser, which reportedly provided superior cleaning without leaving a sticky residue. According to the manufacturer's maintenance engineer, WD-40 Specialist Industrial-Strength Degreaser effectively:

- Removed built-up grease and dirt while preventing grime accumulation
- Kept coilers operating smoothly, eliminating unplanned downtime
- Reduced bearing failures and subsequent repairs
- Improved overall equipment efficiency and productivity

By switching to WD-40 Specialist Industrial- Strength Degreaser, the facility reportedly experienced:

- Elimination of downtime caused by coiler binding
- Estimated annual savings of $24,000 in downtime, wasted product, bearing failures, and maintenance
- Smoother, more reliable equipment operation
- Increased worker efficiency and reduced maintenance efforts.

Testimonial

"The WD-40 Specialist Degreaser has been a game-changer. It doesn't leave a sticky residue that collects dust and grime. Our coilers operate flawlessly, and we've virtually eliminated costly downtime. I highly recommend this product for anyone using automated strapping or banding processes." – Maintenance Engineer

Appendix - Case Study D

CASE STUDY

WD-40 SPECIALIST® GEL LUBE ESTIMATED TO SAVE POULTRY EGG FARM OVER $20,000 ANNUALLY

CUSTOMER CHALLENGE

Company Overview: A large poultry egg farm, located in Southern California, operates one of the region's largest egg-laying facilities—housing more than 2 million hens across 14 barns and producing over 100 million eggs annually. Over 1,000 conveyor chains move manure and eggs through a heavy particulate environment.

According to the company, the facility experienced frequent chain binding and breakage due to their previous lubricant failing to last in harsh, particulate heavy conditions. Maintenance crews were forced to lubricate daily, consuming 60 gallons of product annually and replacing 55 chains per month due to breakage, resulting in downtime, labor inefficiencies, and rising maintenance costs.

Customer-Reported Results

Solution:
We supplied the company with complimentary samples of WD-40 Specialist Gel Lube, whose clinging formula stays in place under load and resists throw-off. It protects metal components from wear and corrosion—ideal for the farm's continuous chains. Because these chains operate below the food line with no potential for food contact, NSF H1 registration was not required.

Results:
Based on an interview with the company personnel, the company reported the following results:
The conversion reduced lubrication from daily to every seven weeks, cut product use from 60 to 12 gallons per year, and eliminated chain replacements. Application maintenance labor dropped by 99%, **delivering an estimated $20,730 in annual savings** through:

- Reduced Product Consumption
- Labor Reduction
- Parts & Repairs

Outcome:
With WD-40 Specialist Gel Lube, the end user achieved smoother chain operation, zero breakage, and extended equipment life—proving the **total cost-of-ownership advantage** of WD-40 Specialist performance.

WD-40® Brand Solution

WD-40 Specialist Gel Lube

Testimonial from a Company Employee:

"I went from replacing 55 chains per month and now I don't have to replace any!"

Appendix - Case Study E

CASE STUDY

WD-40 SPECIALIST® PENETRANT ESTIMATED TO SAVE WIND FARM THOUSANDS OF DOLLARS

CUSTOMER CHALLENGE

Wind farms are large-scale energy installations that harness power from the wind to produce electricity.

Significant focus is placed on optimizing the layout and turbine technology to generate power more efficiently, while ensuring safety for workers and nearby communities.

Central to this process are the turbines themselves, equipped with blades, towers, and gearboxes that must withstand strong gusts and turbulent weather.

Over time, exposure to harsh conditions can cause wear, so regular maintenance is vital to keep turbines spinning effectively and prevent costly breakdowns. If key components become corroded or damaged, they risk reduced performance or even turbine failure, which could lead to energy losses.

We supplied a wind farm operator with a complimentary sample of WD-40 Specialist Penetrant for evaluation and then interviewed its operations service manager about the results.

CUSTOMER REPORTED RESULTS

Due to the importance of quickly freeing stuck key shafts on motors and loosening high-torque bolts (Ex: yaw drive bolts) for regular maintenance, the wind farm's operations service manager tested WD-40 Specialist Penetrant. It was reported that WD-40 Penetrant penetrated rusted, seized parts significantly faster than the previously used competing product.

An added benefit noted was the WD-40 Specialist Penetrant's lower odor, which allows technicians to apply the product without leaving access doors open or stepping away for ventilation. This results in a more comfortable working environment, especially when working on components that require frequent removal. Because of these reported advantages—faster action, reduced odor, and overall lower product usage—the wind farm converted to WD-40 Specialist Penetrant.

By converting to WD-40 Penetrant, this location is **estimated to save approximately 192 maintenance hours annually, valued at $16,320 in savings**. This in turn resulted in a safer, more efficient wind farm facility.

WD-40® Brand Solution

WD-40 Specialist Penetrant

Testimonial

WD-40 Specialist Penetrant was tested by an Operations Service Manager on a wind farm.

"Instead of waiting an hour or half a day [for the penetrant to work], we now wait less than 5 minutes ."

Appendix - Case Study F

CASE STUDY

WD-40 SPECIALIST® | STREAMLINED PREVENTATIVE MAINTENANCE DRIVES SIGNIFICANT ESTIMATED COST SAVINGS

CUSTOMER CHALLENGE

Company Overview: A leading U.S. automotive manufacturer implemented WD-40 Specialist® products across its molding, shearing, and assembly operations to reduce downtime, streamline maintenance routines, and standardize its preventative maintenance practices. By aligning with WD-40 Company's four functions of Preventative Maintenance—Prep It. Clean It. Lube It. Protect It.—the company's maintenance team reportedly achieved measurable improvements in labor efficiency, product utilization, and overall equipment reliability.

The Challenge: According to the company, maintenance teams were spending excessive time re-applying products and waiting for penetrants to take effect. Cleaning and lubrication tasks required multiple products from various suppliers, creating inconsistency and waste. Previously-used products delivered uneven results—causing longer dwell times, higher consumption, and more frequent equipment touchpoints. The maintenance team's proactive approach was to find a cohesive product portfolio that would simplify preventative maintenance, reduce cost of ownership, and improve process efficiency.

Customer-Reported Results

The Solution: We supplied the company with complimentary samples for joint testing with maintenance and engineering teams by replacing multiple existing cleaning and lubricating products with WD-40 Specialist® products aligned to the four pillars of Preventative Maintenance. Based on an interview with the Maintenance Lead, the company reported the following results:

PREP IT

WD-40 Specialist® Industrial-Strength Degreaser

- Cut cleaning time in half for molds, presses, and refurbished components—from 2 hours to 1 hour per cycle. **$5,040 annual labor savings.**

WD-40 Specialist® Penetrant

- Reduced wait time per application by 50% resulting in **$2,520 labor savings annually.** Used on pins, mold cylinders, and rusted fasteners.

CLEAN IT

WD-40 Specialist® Contact Cleaner

- **$1,548 direct product cost savings.** Delivers no-residue finish for electronics, sensitive components, and general cleaning.

LUBE IT

WD-40 Specialist® Roller Chain Lubricant

- 20% decrease in product consumption for chain change-outs and mold press lubrication, **resulting in $720 in annual savings** plus **$2,520 labor savings.**

PROTECT IT

WD-40 Specialist® Dry Lube

- Provided smoother motion and cleaner operation on cylinder shafts and roller bearings, reducing unplanned maintenance.

WD-40® Brand Solution

WD-40 Specialist Industrial-Strength Degreaser
WD-40 Specialist Penetrant
WD-40 Specialist Contact Cleaner
WD-40 Specialist Roller Chain Lubricant
WD-40 Specialist Dry Lube

Testimonial

WD-40 Specialist Products used by the Maintenance Lead:

"I used to have to apply a degreaser then clean it 3-4 times, we cut our degreasing time in half."

Total estimated savings: $12,348 annually