How to Identify Worn Twin-Screw Elements Before They Cause Output and Dispersion Problems



Nanjing, Jiangsu Nov 12, 2026 (Issuewire.com) - How to Identify Worn Twin-Screw Elements Before They Cause Output and Dispersion Problems Early Warning Signals: Diagnosing Extruder Component Wear from Process Data Industrial plastic compounding demands continuous operational stability across every processing campaign. However, abrasive additives such as glass fibers, titanium dioxide, and mineral fillers gradually erode metallic contact surfaces during high-shear mixing. Detecting deteriorating components early prevents severe process disruption and maintains polymer melt quality. Prompt identification of Worn Twin-Screw Elements (https://www.lesunscrew.com/how-to-prepare-a-twin-screw-extruder-screw-element-stock-control-plan-for-a-compounding-plant.html) enables maintenance engineers to schedule planned component replacements before complete operational breakdown occurs. Ignoring progressive mechanical wear inevitably causes unexpected pressure drops, throughput loss, and costly polymer batch contamination. Rather than waiting for catastrophic equipment failure, plant operators should analyze key real-time process metrics to detect internal component degradation early. Establishing systematic diagnostic habits transforms reactive maintenance into a predictable, quality-driven operation. Operating data from a co-rotating twin-screw extruder can provide useful indicators of changes within the processing section. When evaluated against a consistent operating baseline, long-term trends in torque, discharge pressure, melt temperature, and throughput can help reveal abnormal shifts associated with component wear, clearance changes, or declining process stability. First, changes in torque behavior can provide an early indication of progressive wear within the processing section. As screw flights and barrel surfaces wear, internal clearances increase, altering melt leakage, screw filling, and load distribution. Under

comparable feed rate, screw speed, and material conditions, this may appear as a gradual shift in average torque, greater torque variability, or a different torque response at the same throughput. Second, a gradual loss of throughput can indicate declining conveying efficiency. Increased clearances allow more material to recirculate or leak through the screw–barrel and intermeshing gaps, reducing effective forward transport. Operators may compensate by increasing screw speed, but this can raise shear heating and melt temperature, particularly when processing heat-sensitive materials. Third, wear in kneading and mixing elements can reduce both dispersive and distributive mixing performance. The result may be poorer pigment dispersion, uneven filler distribution, incomplete breakup of agglomerates, or greater variation in compound quality. Increased leakage and material hold-up in worn regions can also promote local thermal degradation, contributing to black specks and pellet defects. Fourth, progressive screw and barrel wear can also reduce pressure-building efficiency. As internal leakage increases, a longer fully filled section or higher screw speed may be required to generate the same discharge pressure. A gradual shift in the pressure–throughput relationship under otherwise comparable operating conditions can therefore provide additional evidence of increasing internal wear. On-Site Wear Inspection: Measuring Screw Element and Barrel Degradation Process data can indicate progressive wear, but physical inspection is required to determine the actual condition of screw elements and barrel bores. During scheduled maintenance, the screw assemblies should be removed, cleaned, and inspected against original dimensions and previous wear records. Visual inspection should focus on screw flight crests, kneading-disc tips and flanks, and barrel bore surfaces. Abrasive wear typically appears as rounded or polished edges, while scoring or gouging may indicate abnormal metal contact. Pitting and localized surface attack are more characteristic of corrosive wear. Areas around the transition from solids conveying to melting and intensive mixing often deserve particular attention, especially when processing glass fiber, mineral fillers, or other abrasive compounds. Screw element wear should be quantified by measuring element outside diameter and critical profile dimensions with calibrated micrometers or dedicated wear gauges. Barrel condition should be assessed by barrel bore measurement at defined axial positions. Comparing these measurements with the original specifications provides a wear map and allows changes in screw-to-barrel clearance to be tracked over time. Replacement limits should follow the OEM specification and actual process requirements rather than a universal percentage-based wear threshold. Side-feeding and vent openings can provide useful spot checks of exposed screw surfaces, but they represent only a limited section of the process zone. A clamshell barrel provides much broader access, whereas conventional closed barrels normally require screw removal for a complete screw element and barrel wear inspection. Regular wear measurement during planned shutdowns therefore remains an important part of preventive maintenance for co-rotating twin-screw extruders. The Metallurgy Solution: Why PM-HIP Tool Steel Performs Better in Severe Abrasive Wear When screw element wear becomes a recurring problem, material selection becomes as important as component replacement. Nitrided steel remains a practical choice for moderate-duty service because nitriding produces a hard, wear-resistant surface layer. Under severe abrasive loading from glass fiber, calcium carbonate, talc, or other mineral fillers, however, progressive wear can eventually penetrate the hardened case, after which the underlying steel provides substantially less resistance to dimensional loss. PM-HIP tool steel provides a different metallurgical structure. Pre-alloyed steel powder is produced by gas atomization and consolidated by Hot Isostatic Pressing (HIP) at high temperature and pressure. This route produces a highly dense, homogeneous material with minimal segregation and a fine, uniform distribution of hard carbides. Compared with conventional ingot metallurgy, powder metallurgy also allows highly alloyed tool steels to combine a high carbide content with better microstructural uniformity and useful toughness. These characteristics are particularly valuable in abrasive twin-screw extrusion. Hard vanadium-rich and other alloy carbides, depending on the steel grade, resist micro-cutting and micro-ploughing caused by glass fibers and mineral particles, while the hardened matrix supports the carbides under load. Their fine and uniform distribution also reduces localized weak zones and helps resist edge breakdown and micro-chipping. Because the wear-resistant microstructure extends through the material rather than relying only on a surface-hardened

case, PM-HIP screw elements can retain their wear performance as the working surface gradually recedes. High hardness, compressive strength, toughness, fatigue resistance, and dimensional stability further support long-term service in heavily loaded conveying, kneading, and mixing zones. Effective wear protection also requires the screw elements and barrel to be considered as a tribological system. In highly abrasive applications, PM-HIP screw elements are therefore commonly paired with wear-resistant barrel liners or bimetallic barrel systems selected for the same operating environment. Matching the wear resistance of both surfaces helps limit screw-to-barrel clearance growth, preserve processing geometry, and extend service life. The final material combination should be selected according to the dominant wear mechanism, filler type and loading, process temperature, corrosion exposure, and the specific wear intensity of each screw section. Building a Strategic Defense: Spare Parts Planning and Barrel Wear Protection Wear diagnosis becomes more valuable when it is linked to a structured spare parts strategy. For twin-screw extruders, critical wear parts should be identified according to wear history, replacement frequency, procurement lead time, and the production impact of an unexpected failure. Maintaining selected screw elements and other high-consumption components in stock can significantly reduce downtime during planned or emergency maintenance. Spare parts planning should follow actual wear patterns rather than treating every screw element equally. Elements operating in intensive melting, kneading, high-filler conveying, or other severe wear zones typically require closer monitoring. Combining dimensional inspection records with operating hours allows maintenance teams to establish replacement intervals and replenish inventory before critical components reach their wear limits. The barrel should be evaluated together with the screw elements. As screw and barrel surfaces wear, increasing screw-to-barrel clearance reduces the ability to maintain the original processing geometry. In highly abrasive applications, PM-HIP screw elements can be combined with appropriately selected wear-resistant barrel liners or bimetallic barrel systems. The objective is not to make both components wear at the same rate, but to provide compatible wear resistance and slow clearance growth across the processing section. Lesun twin-screw extruder barrel solutions (https://www.lesunscrew.com/news/precision-and-performance-extruder-barrel-solutions-by-lesun-screw.html) include replaceable and wear-resistant liner systems designed for different processing and maintenance requirements. Finally, maintaining a documented wear history improves both maintenance and inventory decisions. Recording operating hours, screw element dimensions, barrel bore measurements, replacement dates, and application conditions allows plants to identify wear trends and estimate future component demand. This shifts maintenance from reactive replacement toward condition-based maintenance and more predictable spare parts replenishment. Engineering Support Across the Twin-Screw Component Lifecycle Managing wear in a twin-screw extruder requires more than supplying replacement parts. Nanjing Lesun Screw Co., Ltd. (https://www.lesunscrew.com/company-profile.html) supports customers from wear assessment and reverse engineering through material selection, component manufacturing, quality verification, and long-term spare parts supply. For worn or damaged components, Lesun combines visual wear-pattern assessment with dimensional and material inspection to determine the likely failure mechanism. Depending on the component and evaluation requirement, inspection capabilities include 2D optical measurement, 3D scanning, CMM inspection, chemical composition analysis, ultrasonic testing, metallographic examination, hardness testing, and other mechanical and non-destructive testing methods. These data help distinguish abrasive wear, corrosion, abnormal contact, dimensional loss, and material-related failure before a replacement or upgrade is specified. When original drawings are unavailable, screw elements, screw shafts, and extruder barrels can be reconstructed from physical samples through measurement and reverse engineering. Critical geometry, spline interfaces, tolerance fits, and assembly dimensions are rebuilt into production-ready drawings and technical records. For established extruder platforms, Lesun also uses its multi-brand component database to support OEM-compatible replacement and repeat orders. Material selection is matched to the actual operating condition rather than based on hardness alone. Depending on abrasive loading, corrosion exposure, torque, filler content, and component location, engineers can evaluate nitrided steels, tool steels, PM-

HIP grades, corrosion-resistant alloys, and wear-resistant barrel liner systems. Technical support can also extend to screw configuration review, special-function screw element development, and localized material upgrades for high-wear sections. Manufacturing is supported by a traceable quality-control system covering raw-material verification, heat treatment, precision machining, and final inspection. Critical dimensions such as screw profiles, outside diameters, spline geometry, concentricity, and mating features are verified using dedicated gauges and precision measuring equipment. Material batches, heat-treatment records, process data, and final inspection results are retained to support repeatable replacement-part supply. By linking wear analysis, reverse engineering, application-specific metallurgy, precision manufacturing, and spare-parts planning, Lesun helps compounders manage twin-screw extruder wear as a lifecycle engineering issue rather than a series of isolated component failures. Discover high-performance twin-screw extruder components and engineering solutions at https://www.lesunscrew.com/ (https://www.lesunscrew.com/?utm_source=gemini).



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