ADVANCED SURFACE ENGINEERING | SINCE 1992

RK9999 LS
LIGHTNING SERIES

Advanced HVOF Tungsten Carbide Wear Protection

A premium screw-protection system engineered for demanding extrusion and injection applications where abrasion, corrosion and sustained production wear shorten conventional screw life.

UP TO 5×	UP TO 13×	<1.0%	68–71 HRC
FLIGHT WEAR RESISTANCE	CORROSION RESISTANCE	ESTIMATED POROSITY	HARDNESS RANGE

Performance multipliers are stated in the supplied RK9999 performance data. Actual service life depends on polymer, fillers, barrel pairing, temperature, throughput and operating practice.

THE OPERATING PROBLEM

Why Conventional Screws Lose Performance

Screw wear is rarely one mechanism. Abrasion, adhesive contact and corrosion often act together—and the commercial cost appears as unstable processing, downtime and repeated replacement.

01

ADHESIVE WEAR

Local metal-to-metal contact under load and shear can create micro-welding and material removal at working surfaces.

02

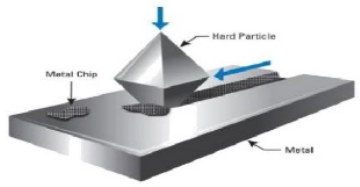
ABRASIVE WEAR

Hard fillers and particles trapped between screw and barrel can progressively erode flight lands, sides and root areas.

03

CORROSIVE ATTACK

Aggressive processing environments—including chlorine-bearing PVC and CPVC systems—can chemically attack exposed surfaces.



WHAT WEAR CHANGES IN PRODUCTION

- Loss of screw geometry and increased screw-to-barrel clearance.
- Reduced pressure-building and mixing consistency.
- Output variation, higher scrap risk and more process adjustment.
- Unplanned shutdowns, repair activity and replacement cost.

Where RK9999 LS is most relevant

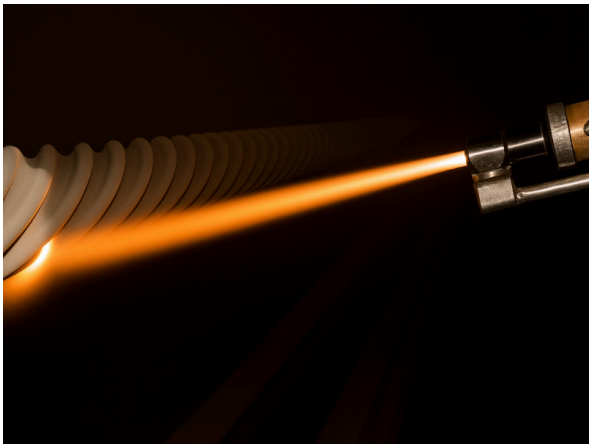
Consider RK9999 LS when the process involves **abrasive additives, corrosive compounds, high duty cycles, recurring flight/root wear** or repeated screw replacement. Final suitability must be based on the material formulation, barrel condition and operating window.

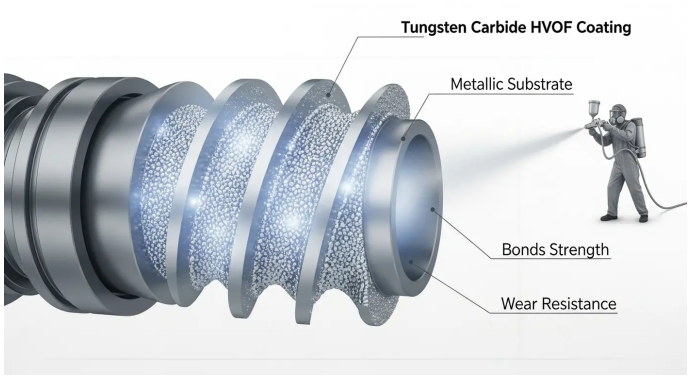
COMMERCIAL IMPACT The purpose is not merely a harder surface. It is to preserve working geometry for longer so production remains controllable and maintenance becomes more predictable.

THE TECHNOLOGY

What Is RK9999 LS—and How Is It Applied?

RK9999 LS uses a dense tungsten-carbide/cobalt wear layer deposited by a controlled robotic High Velocity Oxy-Fuel thermal spray process.





Controlled HVOF deposition and a simplified coating/substrate illustration.

The four-stage process

1
PREPARE
Machine, clean and prepare the specified screw surfaces.

2
DEPOSIT
Apply RK9999 LS by controlled robotic HVOF spraying.

3
FINISH
Precision grind and super-finish the working surfaces.

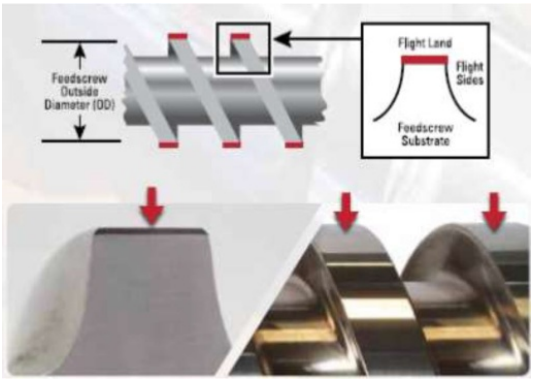
4
VERIFY
Check thickness, runout, hardness and surface roughness.

COATING REFERENCE WC 85% V/V + Co 15% V/V • 2–5 micron particle size • 0.25 mm per face • 0.500 mm overall coating reference • density 14.7 g/cm³

WHY MANUFACTURERS CHOOSE IT

Production Benefits That Matter

The value comes from maintaining the geometry and surface condition that the process depends on—not from hardness alone.



PROTECTED WORKING AREAS

- Flight lands and side faces exposed to abrasive contact.
- Roots and transition areas susceptible to premature wear.
- Critical surfaces requiring controlled finish and dimensions.
- Optional full encapsulation where wider corrosion protection is required.

LONGER WEAR WINDOW
Dense carbide protection helps slow loss of flight geometry under demanding abrasion.

MORE STABLE PROCESSING
Preserved geometry supports more consistent pressure development, mixing and output.

REDUCED ADHESIVE WEAR
A hard, super-finished working surface helps reduce metal-to-metal wear mechanisms.

LOWER RESIDUE RETENTION
Surface finish below 0.10 Ra µm helps reduce friction, material drag and residue hold-up.

FLEXIBLE BARREL PAIRING
Designed for nitrided, tungsten-carbide-lined and hardened tool-steel barrel systems.

BETTER MAINTENANCE ECONOMICS
Longer usable intervals can reduce replacement frequency and unplanned intervention.

IMPORTANT A coating does not correct a worn, misaligned or unsuitable barrel. Screw and barrel condition should be reviewed together before final selection.

SUPPLIED TEST AND CERTIFICATION DATA

Performance Evidence

The strongest sales case is measurable: dense structure, controlled adhesion, high hardness and low abrasion-test volume loss.

UP TO 5× Flight wear resistance	**UP TO 13×** Corrosion resistance	**<1.0%** Estimated porosity
12,000 PSI Average certificate bond strength	**425°C** Maximum service temperature	**<0.10 Ra µm** Super-finished surface
68–71 HRC Hardness range	**3.0 mm³** ASTM G65 volume loss	**+0.00 / −0.05 mm** OD thickness tolerance

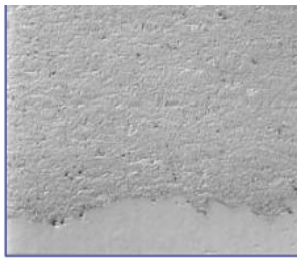
Abrasion-test comparison — lower volume loss is better

Material / coating	Loss	Relative visual
RK9999 LS	**3.0 mm³**	
CPM9V	9.5 mm³	
NiCrB “56”	15.0 mm³	
Cobalt #12	19.0 mm³	

Supplied reference: ASTM G65 Procedure B, 2,000 revolutions.

Fine cracks in conventional plating

Dense RK9999 reference microstructure



Supplied coating cross-section

All comparative multipliers, micrographs and abrasion values above are reproduced from supplied performance information; field performance varies by application.

CONTROLLED COATING REFERENCE

Technical Specification

A concise specification for commercial evaluation and application review.

PARAMETER	SPECIFICATION
Process method	Robotic HVOF coating
Powder grade	RK9999 LS Series — proprietary supplied grade
Composition	Tungsten Carbide (WC) 85% V/V + Cobalt (Co) 15% V/V
Coating thickness	0.25 mm per face
Overall coating reference	0.500 mm
Particle size	2–5 micron — 100%
Density	14.7 g/cm³
Superficial hardness	92.5 15N
Macro hardness	RC 69–70
Hardness range	68–71 HRC
Estimated porosity	<1.0%
Maximum service temperature	425°C
Bond strength — ASTM C633	Average 12,000 PSI (>80 MPa); feature reference 10,000 PSI
Abrasion resistance	ASTM G65 Procedure B; 2,000 revolutions
Volume loss	3.0 mm³
OD thickness tolerance	+0.00 / −0.05 mm
Core tolerance	N/A

SPECIFICATION CONTROL The latest approved certificate, order-specific drawing and agreed inspection criteria should govern final supply.

LIFECYCLE ECONOMICS

Illustrative Financial Impact

Reference comparison for a KET 65/22 screw-barrel set at 250 kg/h rated output.

₹73.55/kg	13,000 h	3,250 t	₹0.21/kg
REFERENCE SELLING PRICE	RK9999 STATED LIFE	REFERENCE PRODUCTION	SET COST INTENSITY

Reference 50 PHR formulation economics

CONTENT	RECIPE (KG)	RATE (₹/KG)	COST CONTRIBUTION (₹/KG)
Resin	50.00	90	45.000
Calcium	50.00	15	7.500
One pack	2.10	200	4.200
Wax	0.15	150	0.225
Stearic acid	0.15	160	0.240
TiO_2	0.28	140	0.392
₹57.557 FORMULATION COST	₹8.00 CONVERSION COST	₹8.00 PROFIT MARGIN	₹73.55 SELLING PRICE

Screw-barrel lifecycle comparison at 250 kg/h

OPTION	LIFE (H)	PROD. LOSS (KG)	POST-CRITICAL LOSS (KG)	ACTUAL PROD. (T)	SET COST (₹)	COST / KG (₹)
Local nitrided	5,000	80,000	144,000	1,026	3,00,000	0.29
RK nitrided	7,000	60,000	108,000	1,582	3,60,000	0.23
RK9999 LS	13,000	0	0	3,250	6,90,000	0.21

2.60× LIFE Compared with the 5,000-hour local nitrided reference.	**₹0.21 / KG** **Lowest set-cost intensity despite the highest initial set cost.**	3,250 TONNES Reference lifetime production before set replacement.

CALCULATION BASIS Actual production = rated output × stated life − production loss − post-critical loss. Set cost intensity = set cost ÷ actual production in kg.

SELECT THE PROTECTION AROUND THE FAILURE MODE

Application & Configuration Guide

The correct coating scope depends on where wear occurs, how corrosive the formulation is and which barrel system the screw will operate against.

Typical application fit

EXTRUSION SCREWS
PVC, CPVC, profile, pipe and other demanding extrusion duties.

INJECTION SCREWS
Applications requiring improved resistance to abrasive or corrosive processing conditions.

FILLED COMPOUNDS
Formulations containing abrasive mineral, pigment or reinforcing additions.

HIGH-DUTY PRODUCTION
Continuous production where screw geometry and predictable maintenance intervals matter.

Protection options

FLIGHT / OD PROTECTION	For wear concentrated on flight lands, side faces and selected working zones. Suitable where abrasion is the primary concern.
FULL ENCAPSULATION	Broader surface coverage for severe wear/corrosion exposure. Available for CPVC applications subject to application review.

Compatible barrel systems

Designed for pairing with **nitrided barrels, tungsten-carbide-lined barrels and hardened tool-steel barrel systems**. Barrel bore condition, hardness, clearance and alignment must be verified before installation.

Application review checklist

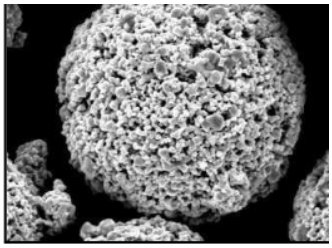
01 Polymer and complete filler/additive package
02 Current screw material, hardness and observed wear location
03 Barrel type, bore condition and operating clearance
04 Processing temperatures, throughput and duty cycle
05 Required coating scope: selected faces, OD or full encapsulation

CONTROLLED FROM PREPARATION TO FINAL INSPECTION

Quality Assurance & Conformance

Every RK9999 LS application is checked through defined measurement and process controls to support coating consistency and dimensional accuracy.

COATING THICKNESS	Pre- and post-coating measurements verify deposited thickness and final dimensions.
STRAIGHTNESS & RUNOUT	TIR checks confirm straightness and runout after processing and finishing.
HARDNESS CONSISTENCY	Controlled deposition parameters support consistent coating hardness.
SURFACE ROUGHNESS	A calibrated profile meter verifies the specified super-finished surface.
PROCESS CONTROL	Periodic equipment calibration and maintenance support repeatable coating tolerances and deposition.



Supplied spray-dried powder micrograph

BUILT FOR SEVERE WEAR CONDITIONS

High hardness, dense HVOF deposition, strong adhesion and precision super-finishing combine to protect the surfaces that determine screw performance.

Request an application review and coating recommendation

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Technical terminology checked against ASTM C633 and recognized HVOF process references. Final supply remains subject to the approved order specification and certificate.