

Xtelk



**Geared toward superior
performance and productivity**



Gear Couplings



- **Customized to exceed the demands of each specific mill application**
- **Engineered for optimal performance and integrity**
- **Manufactured to the highest quality standards**
- **Metallurgically tailored to optimize material properties**
- **Thermally refined using the Xtek Tool Steel Processes**

Engineering

The Xtek gear couplings are highly engineered and customized products. The extensive engineering team is involved with every aspect of the gear coupling; from concept and design, through manufacturing, to evaluation and the eventual servicing and reconditioning. This engineering evolution, ensures that each gear coupling is optimized for peak performance.



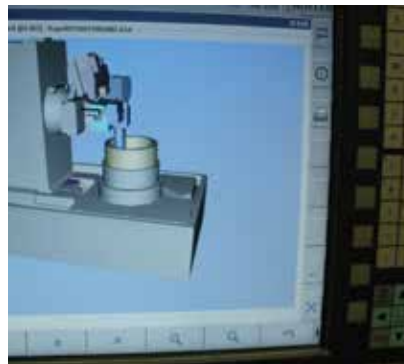
Model and FEA showing wear pattern and stress concentration points in a coupling ring gear and hub gear at a 3° operating angle.

Manufacturing

Xtek gear coupling components are machined to tight tolerances and stringent specifications on state-of-the-art machine tools. Many of the machine tools are customized for the machining of specific coupling components.



Coupling ring gear during finish grinding of the internal gear teeth.





Rolling Tons More than the Competition!

Metallurgy

Material selection is a primary function of the metallurgy group and writing the specific thermal processing cycles is a critical step in optimizing the material properties required in the gear coupling components.

Photomicrograph (100X)
of case microstructure of
coupling gear tooth produced
by the Xtek TSP.



Thermal Processing

The Xtek Tool Steel Processes (TSP) have been in existence for over 100 years. These captive and exclusive thermal processes tailor the properties of each gear coupling component, resulting in metallurgically superior products.

Hub gear being removed
from heat treating furnace
prior to quenching.



100 MONTH CAMPAIGN

Xtek Gear Coupling assemblies, serial numbers 4H-1 and 4H-2, are a set of roughing mill spindles in an 80" hot strip steel mill application. This set of spindles was in service for 100 months and rolled 52,500,000 tons of steel before being removed from service for "scheduled" maintenance. After a thorough inspection and evaluation, Xtek 4H-1 and 4H-2 received only minor reconditioning and were returned for service. An example of extreme performance and longevity of Xtek Gear Couplings.

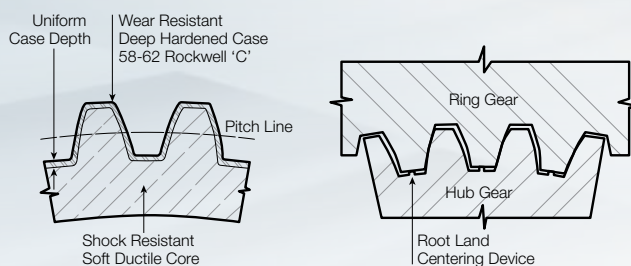


Inspection photograph of Xtek "4H-2"
TSP hard-finished roll end hub gear.

RING GEAR

Xtek TSP Unitized Ring Gear Design with Root Land Centering Device

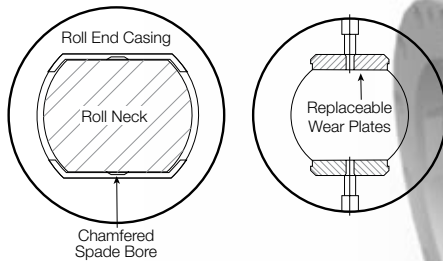
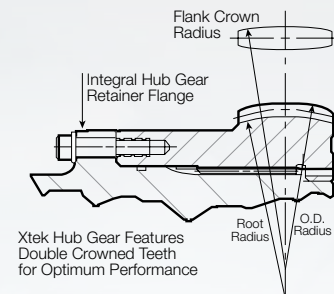
- Xtek TSP hardened case with surface hardness of 58 – 62 HRC
- Root Land Centering Device pilots with the tip of the mating hub gear tooth to ensure diametrical clearances and concentricity through the wide ranges of operating angularity



HUB GEAR

Xtek TSP Hard-Finished Hub Gear with Splined Connection Option

- Xtek TSP hardened case with surface hardness of 58 – 62 HRC
- Double crowned tooth design ensures optimal load carrying capability at various operating angles with minimal contact stress
- Multiple design options available
 - Hard-finished fully ground root
 - Welded-on or Bolted-on
 - Splined and interference fit
 - Splined and double piloted



ROLL END CASING

Xtek TSP Integral Spade Bore Design with External Piloting Ring Option

- Xtek TSP deep hardened case with minimum 0.250" case depth
- Precision ground wear surfaces for close tolerance fit between casing and roll drive spade
- Large chamfer for easy roll insertion
- Multiple design options available
 - Integral spade bore type
 - Replaceable keyed-type
 - External piloting ring
 - Internal piloting ring

THRUST COMPONENTS AND SPRING GUIDE ASSEMBLY

- Thrust components, including the thrust plate and thrust button, have an Xtek TSP hardened case with surface hardness of 58 – 62 HRC
- The spring guide assembly eliminates the need for a casing support system and is designed to keep the casing parallel with the roll neck during roll change
- Thrust plates are held in place by interference fits and require no internal bolts

XGC 80639 - RATED CAPABILITY

Normal Operating Torque	-	23,586,858 IN-LBS
Peak Operating Torque	-	29,545,643 IN-LBS
Maximum Torque	-	50,277,250 IN-LBS

Operating Angle	-	3° 15'
Max Static Angle	-	4°
Operating Offset	-	6.265"
Max Static Offset	-	8.670"

Capability of Gearing at 3° 15'

Normal Operating Torque	-	26,165,706 IN-LBS
Peak Operating Torque	-	36,229,437 IN-LBS
Maximum Torque	-	57,967,100 IN-LBS

***XGC 80639 Shown**



SPINDLE

- Manufactured from medium carbon alloy steel and heat-treated to 280-320 BHN
- Splined ends to accommodate replaceable hub gears
- Telescoping options maintain axial force in the assembly at any shaft separation
 - Central Coil Spring Assembly Option
 - Central Disc Spring Assembly Option



Telescoping Spindle Option

Xtek Oil Circulating Gear Coupling



***XGC 146150 Shown**

- Internal oil-through-spindle technology is a superior solution for oil circulation in gear couplings
- The Xtek Ball-and-Socket Seal is of a dynamic design that utilizes high-performance materials (*See additional data at right*)
- Utilizes the same Xtek TSP gearing components as standard grease-type gear couplings
- Adaptable to existing roll end and drive end casing designs
- Maintains Xtek DriveWatch compatibility

The Xtek Advantages

- Internal oil-through-spindle technology and Ball-and-Socket Seal eliminates the external oil re-circulating tube
- More reliable and maintenance friendly with less parts and fewer mechanical connections
- Less susceptible to damage during mill installation and operation
- Compatible with Xtek superior gearing components
- Modifiable from existing gear coupling designs
- Works with all spindle support systems

The Xtek Ball-and-Socket Seal

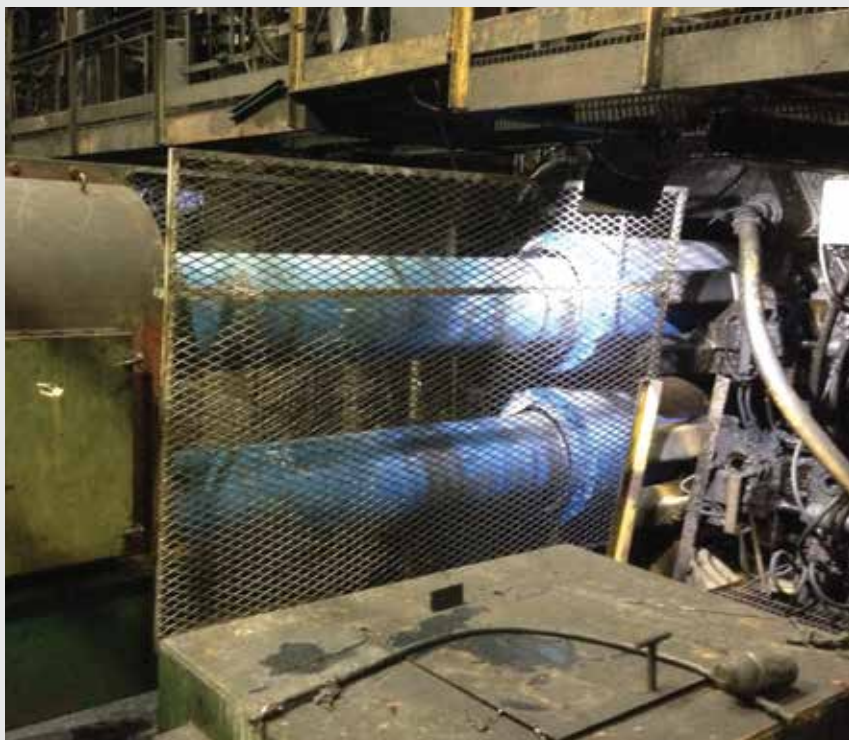
The Xtek Ball-and-Socket Seal was designed exclusively for the oil circulating gear couplings, with operating speeds and angles the mill applications have to offer. The seal is highly dynamic, articulating through multiple axes at any given angular rotation of the spindle. The use of high-performance, long lasting, wear materials and durable support components allow this seal to excel in service.





Product Spotlight

Xtek Gear Couplings model XGC 146150, serial numbers 7 (top) and 10 (bottom), in their second campaign after conversion to the Xtek oil circulating design.



Xtek Gear Coupling Management Programs

Xtek offers gear coupling management programs and coupling reconditioning services to all the mills that use geared spindle couplings. The programs focus on coupling tracking and scheduling, inventory services, and superior customer service.

Tracking and Scheduling

- Monitor all gear coupling activities and provide reports to illustrate status, history, and performance
- All spindle shafts are marked with a permanent ID number for tracking
- Database tracks performance and history
- Information from database is the basis for performance enhancements and to develop maintenance schedules



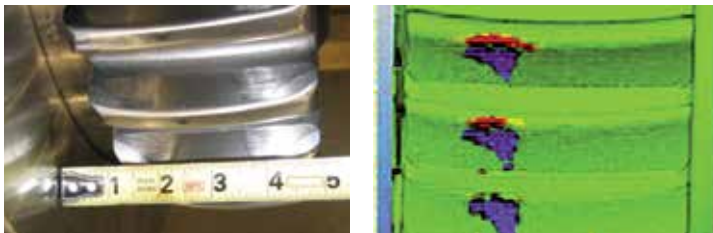
Inventory Services

To support all reconditioning programs, Xtek has developed a Raw Material Family of Parts Inventory System. This system ensures that raw material necessary for production of long lead item components is present at Xtek. This eliminates the raw material lead time from the production schedule. This, in combination with the scheduled change out plans for the spindles in the mill, allows us to recondition the spindles in a timely manner.



Superior Customer Service

- Xtek ensures that dedicated individuals are available during the duration of the coupling management program
- Xtek local sales representatives are available as the initial point of contact for technical and commercial issues
- A service engineer and account manager are assigned to each specific program
- These individuals meet with mill personnel and make recommendations as required



The photograph at left is of a hard-finished hub gear that was removed for evaluation after 12 hours of operation. The photograph shows the polished areas of the hub gear teeth. The screen shot on the right is the solid model of the exact same hub gear after conducting an FEA on the part. The FEA shows the location of the contact stresses on the teeth after modeling it through the same angles and applied forces as the actual application. The consistency between the FEA results and the measurement of the actual part verify the accuracy of the analysis.



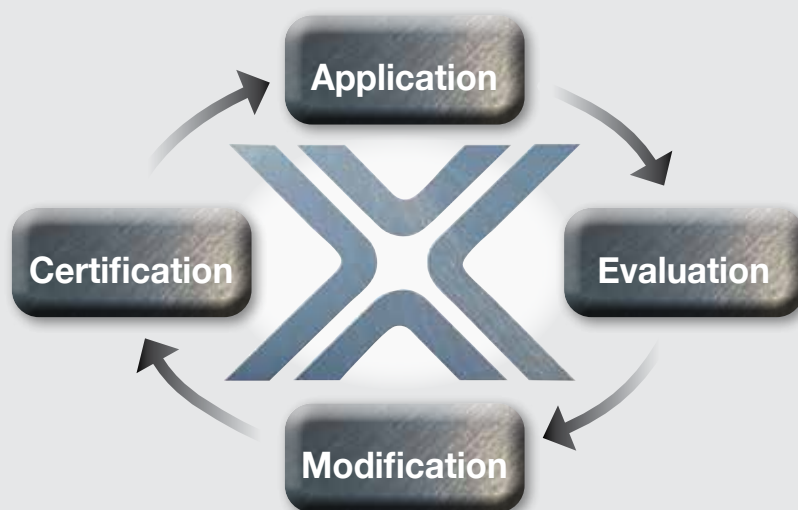
The photograph at left is of a standard finished ring gear after an extended campaign in the mill. The photograph shows the extent and location of the wear of the gear teeth. The screen shot on the right is the solid model of the exact same ring gear after conducting an FEA on the part. The FEA suggests that the teeth would wear and ultimately fail as a result of tooth interference under applied load. Confirming the accuracy of the models with confirmed evaluations helps in the development of gear component life expectancy after mill setup changes.

and Reconditioning Services

The Xtek Gear Coupling Reconditioning Cycle

The Xtek gear coupling reconditioning cycle is a perfect example of the Xtek Continuous Improvement Principle.

- The gear couplings are received from the application and prepared for servicing and reconditioning.
- Technicians, Inspectors, and Engineers collect and evaluate all the data, and make recommendations for improvement.
- Manufacturing performs the recommended modifications using standard operating procedures and quality standards.
- Technicians, Inspectors, and Engineers certify that the reconditioned assembly is ready for the next mill campaign.



EXTENDING MILL CAMPAIGNS AND LOWERING OPERATING COSTS



The as-machined surface of a TSP Roll End Casing following the Electro Discharge-Machining (EDM) process.



A roll end casing during the 3D laser scanning process. The laser scanner verifies dimensions on finished parts, is used to generate solid models of complex parts, and is a vital part in generating engineering analyses that require high precision and accuracy.



Coupling adapter and spindle weldment assembly, during the submerged arc welding (SAW) process. In many cases reconditioned gear coupling assemblies require that replacement components are joined to modified components. All welding processes at Xtek are tightly controlled and utilize superior welding wires and flux combinations to produce the desired metallurgical properties.



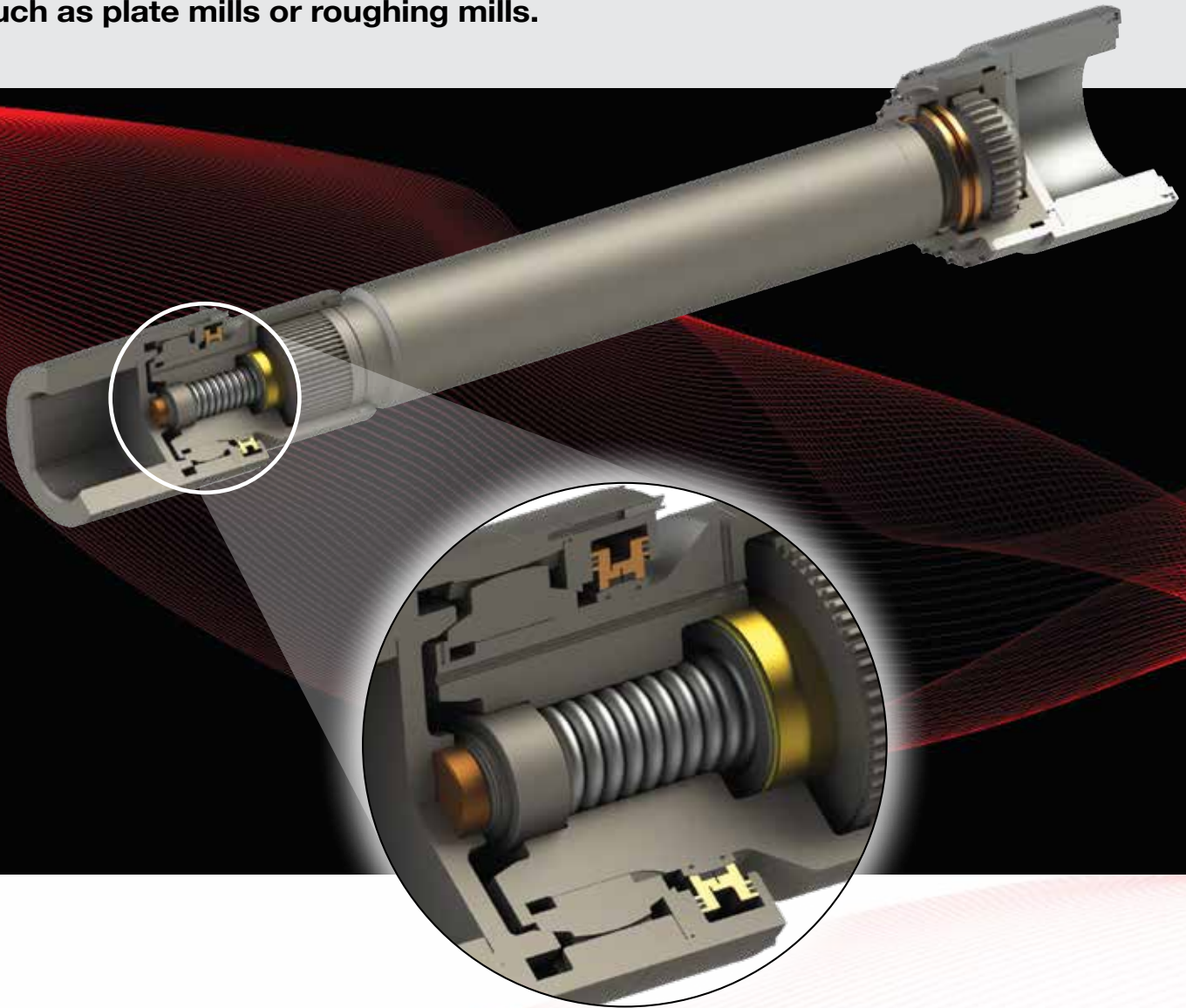
Splined coupling adapter and hub gear at final inspection.



HSM F1-F3 Gear Coupling X-03, along with DE Thrust Plate and DE Ring Gear, ready for shipment.

Xtek High Angle Couplings

Xtek has designed a coupling that allows for higher angle applications with greater tooth engagement than standard couplings. The new design extends the operating window to include applications that typically would need higher angles, such as plate mills or roughing mills.



Optimized Hub Gear and Ring Gear Design

- Allows operation at higher angles, up to 5°
- New patented tooth form promotes more teeth in contact and lower stress values per tooth
- Optimized profiles of both gear elements to control location of contact zone
- Optimized lead of both gearing elements to reduce backlash as the operating angle increases
- This greater tooth engagement yields increases in strength, durability, and maximum power transmission in similarly sized couplings

Xtek Formula 800 & Formula 1000

**Xtek Formula 800 and
Formula 1000 Ultra High
Performance Greases**

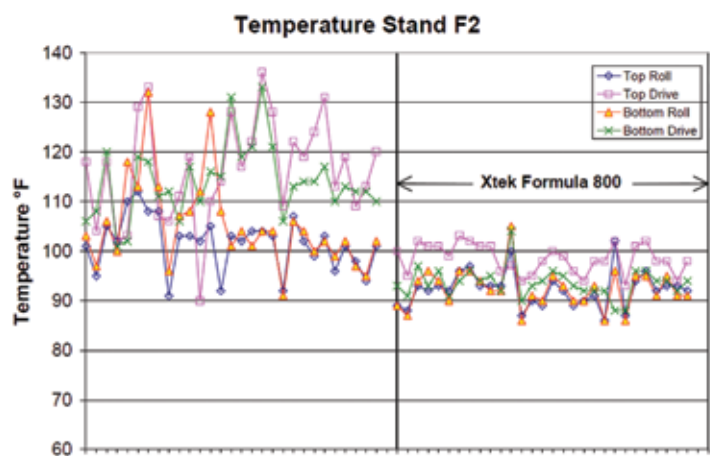
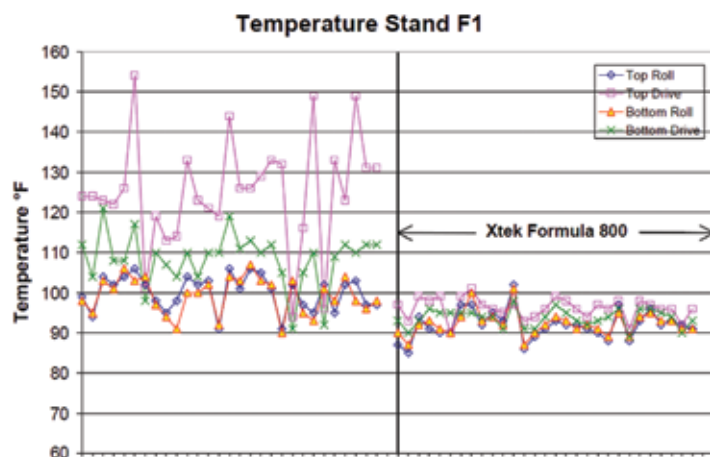
were developed specifically to extend gear coupling campaign length, reduce grease consumption, and reduce overall spindle operating cost per-ton.



Formula 800 for high torque and high angle applications.



Formula 1000 for high speed and high angle applications.



Examples of trend analysis charts obtained from actual Xtek DriveWatch installation. The charts show the significant drop in operating temperatures in the gear cavities of gear couplings after switching to Xtek Formula 800 Ultra High Performance Grease.



Xtek hard-finished hub gear after an extended campaign. With Xtek Formula 800 and proper greasing procedures in place, the hub gear showed only slight polishing of the gear teeth.

Xtek: A Trusted World Leader in Heavy Industry Components for Over 100 Years.

Wheel & Wheel Assemblies



- Xtek crane, brake and sheave wheels are the industry's longest lasting wheel products
- Proprietary heat treatment provides industry's best performing wheels
- Emergency breakdown services available

Gearing & Gearboxes



- AGMA 15 capability
- TSP carburizing to 58-62 HRC
- Gear diameters from 10" - 100"
- Up to 100,000 pounds
- Reverse engineering and FEA analysis
- Gearbox reconditioning specialists

Pinch Rolls



- Design and manufacturing of pinch rolls that catch the strip and direct it down into the coiler
- Excellent wear and material pick-up resistance
- High strength and resistant to thermal fatigue/thermal shock
- Highly qualified provider of customized pinch roll reconditioning services

Universal Joints



- Xtek manufactures closed-eye, split-eye, and block-type tight joints
- 220mm – 800mm standard sizes, others available upon request and evaluation
- A variety of flange connections are offered including: face key, integral pad, welded, and hirth serrations
- Special customized design features will be evaluated based upon the application

Maintenance Services Group



- Well Trained Mobile Crews of Mechanics, Welders and Machinists
- 24/7 Support for breakdowns and in plant outages
- On-site machining and alignment services
- Self-Sufficient crews travel in company trucks with well-equipped tool trailers

Material Handling Group



- Design & manufacturing of heavy duty lifting and floor based equipment
- Multiple options for handling coil, slab, sheet, ingot, tube and specialty products
- Licensed, professional engineers on staff
- Lifter inspection services
- Repair and retrofitting of all lifter brands

Xtek

Solutions in Motion

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