

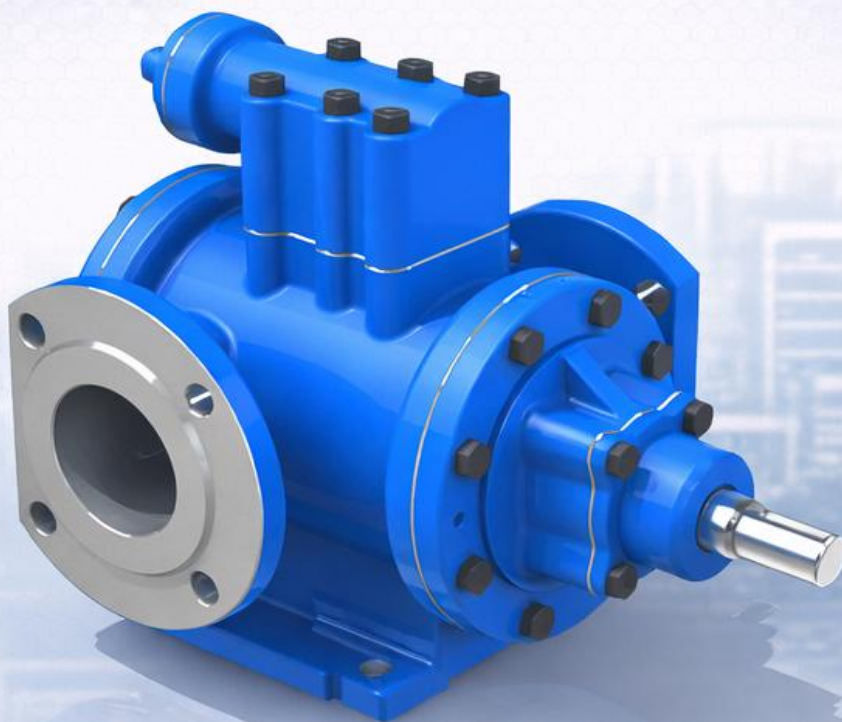


SPEW

POSITIVE DISPLACEMENT PUMPS

TRIPLE SCREW PUMP

MODEL: STN



KNOWLEDGE BASE & TECHNICAL DOCUMENTS

SPEW POSITIVE DISPLACEMENT PUMPS

TRIPLE SCREW PUMP – MODEL: STN

(Low Pressure | High Viscosity Applications)

1. INTRODUCTION

The **SPEW STN Series Triple Screw Pump** is a rotary positive displacement pump specially engineered for the **smooth, continuous, and pulsation-free handling of high-viscosity fluids at low to moderate operating pressures** where high temperature matters.

Unlike high-pressure tri-screw pumps used in hydraulic or lubrication systems, the **STN series is optimized for viscous process fluids**, where **gentle handling, stable flow, low shear, and reliable suction performance and temperature** are critical.

The pump is ideally suited for **heavy oils, polymers, resins, fuels, bitumen blends, molasses, and other viscous industrial liquids** where centrifugal pumps fail to perform efficiently.

2. PUMP CLASSIFICATION

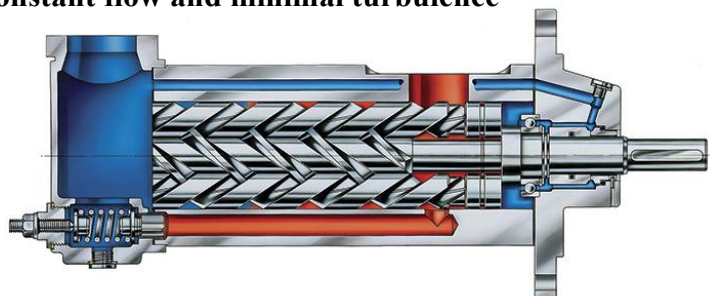
- **Pump Type** : Rotary Positive Displacement
- **Screw Arrangement** : Triple Screw (1 driving screw + 2 idler screws)
- **Pressure Range** : Low pressure
- **Viscosity Range** : Medium to very high viscosity
- **Flow Characteristics** : Continuous, non-pulsating
- **Operating Speed** : Low to moderate RPM
- **Lubrication Mode** : Process-fluid lubricated

3. WORKING PRINCIPLE

The **STN Triple Screw Pump** operates on the **hydrodynamically balanced screw pumping principle**.

Operating Sequence:

1. The **central power screw** is driven by the motor
2. Two **idler screws** rotate due to hydraulic forces (no direct drive)
3. Fluid enters the suction port and fills cavities formed between screws and casing
4. These cavities move **axially** from suction to discharge
5. Fluid is discharged smoothly with **constant flow and minimal turbulence**



Critical Design Feature:

- **No metal-to-metal contact** between screws during normal operation
- The pumped fluid itself provides **lubrication and sealing**

4. DESIGN PHILOSOPHY – STN SERIES

The STN pump is designed with emphasis on:

- Handling **high viscosity fluids efficiently**
- Maintaining **low internal shear**
- Operating at **low discharge pressures**
- Achieving **stable flow at low speeds**
- Providing **long service life with minimal wear**

5. MAIN CONSTRUCTION FEATURES

5.1 Pump Casing

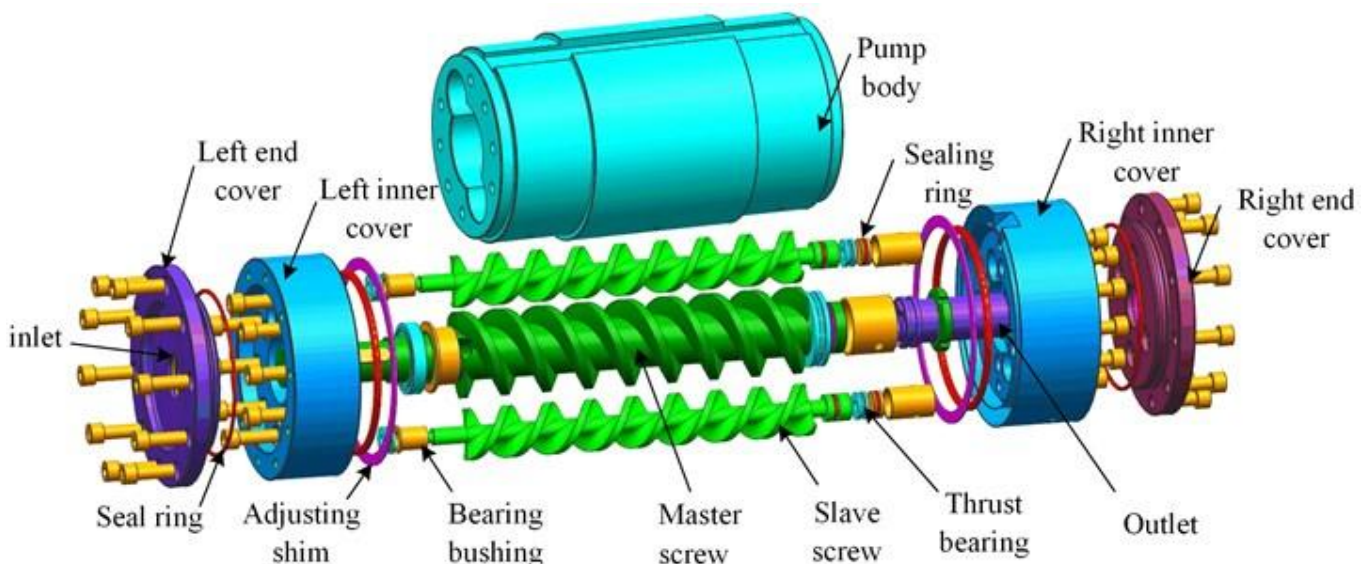
- Precision-machined housing
- Optimized internal clearances for viscous fluids
- Heavy-duty construction for thermal stability

5.2 Screw Set

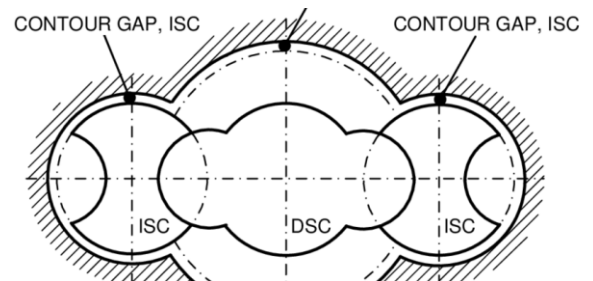
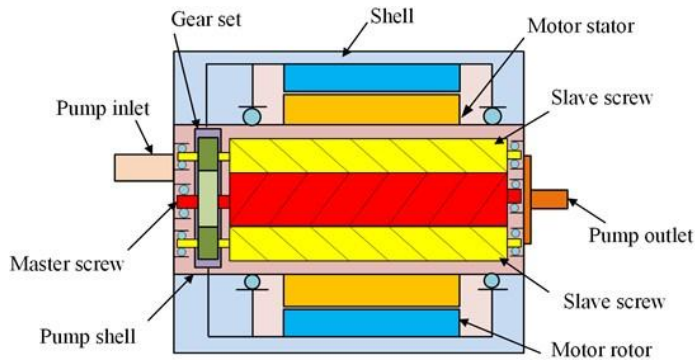
- One hardened **driving screw**
- Two floating **idler screws**
- Optimized helix angle for viscous flow
- Balanced hydraulic loading

5.3 Shaft & Bearings

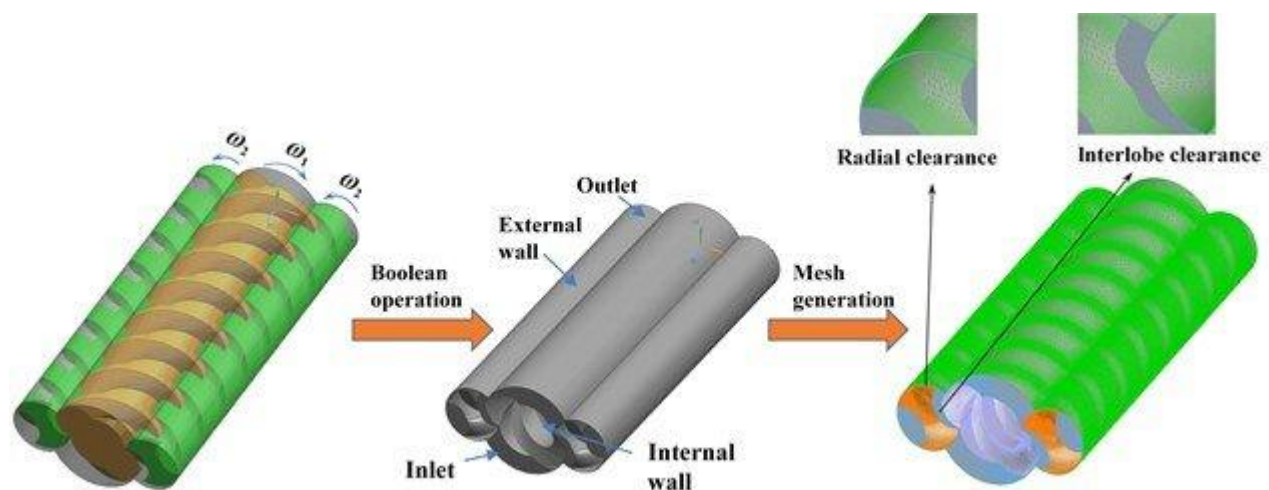
- Robust drive shaft
- Bearings sized for **viscosity-induced torque**
- External bearing lubrication options



6. INTERNAL SCREW GEOMETRY (TRIPLE SCREW ARRANGEMENT)



7. AXIAL FLOW PATH – HIGH VISCOSITY OPTIMIZED

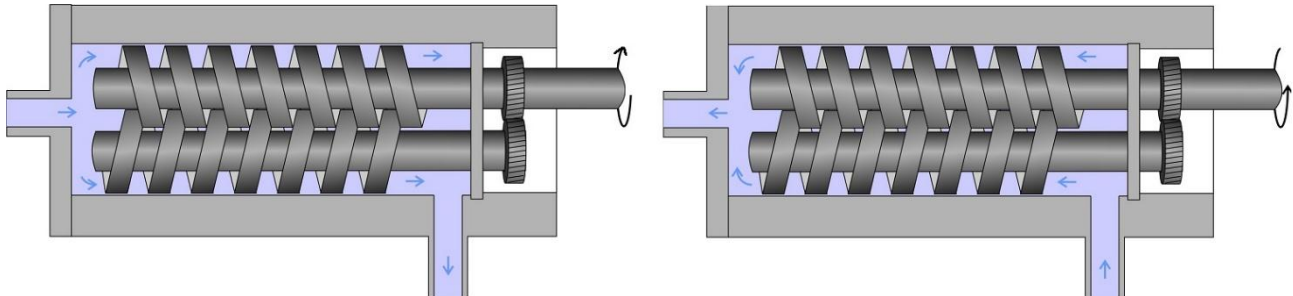


Flow Sequence

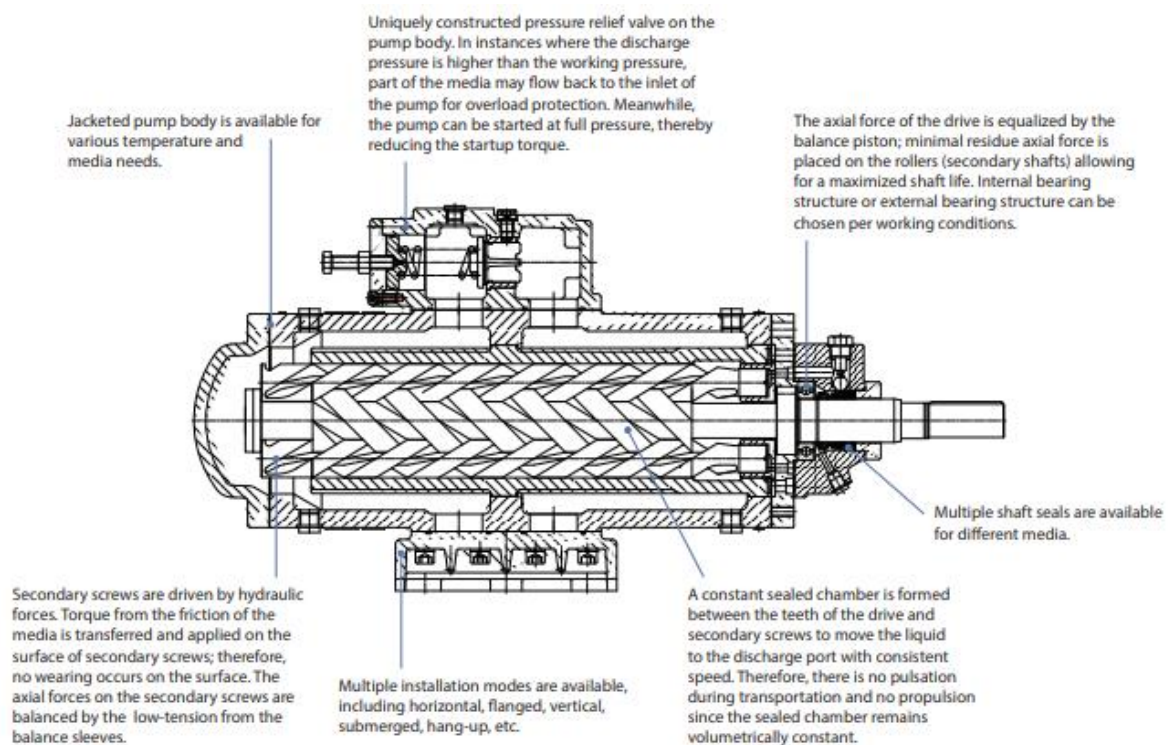
1. **Suction Entry**
 - High-viscosity fluid enters through large suction port
 - Flooded suction recommended for STN
2. **Cavity Formation**
 - Fluid fills cavities between:
 - Power screw
 - Idler screws
 - Pump casing
3. **Axial Transport**
 - Cavities move smoothly along pump axis
 - No backflow or turbulence
 - Flow remains constant regardless of viscosity changes
4. **Discharge**
 - Cavities collapse gradually
 - Fluid exits at stable, low pressure

Flow Nature

- Continuous
- Non-pulsating
- Extremely low shear
- Ideal for sensitive viscous fluids



8. HYDRAULIC BALANCING MECHANISM



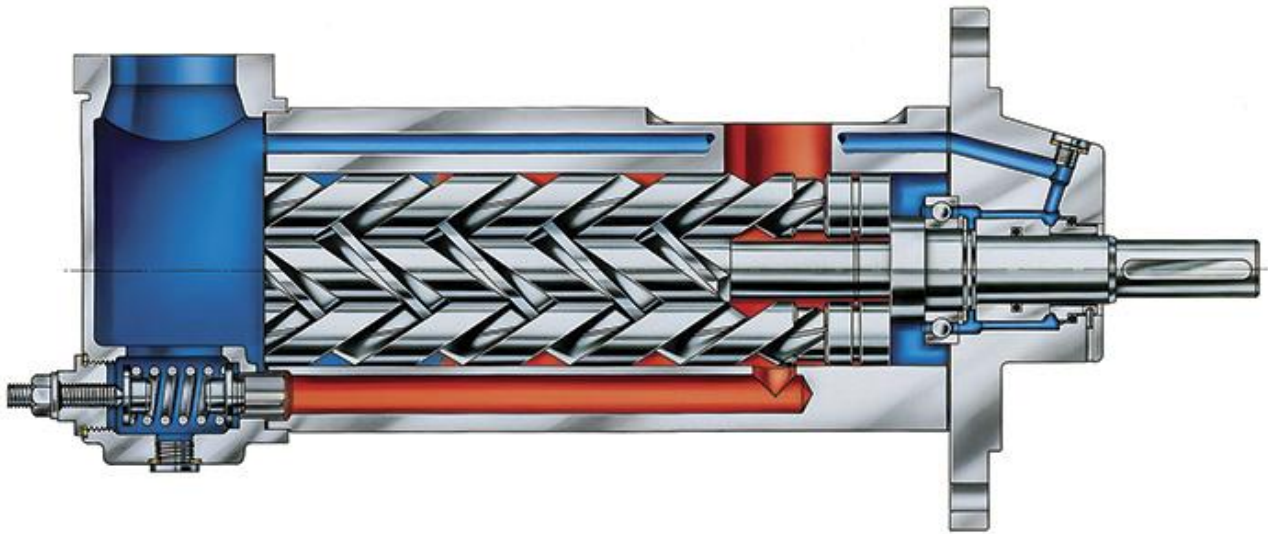
How STN Achieves Balance

- Axial forces generated by pressure are **internally counteracted**
- Idler screws distribute hydraulic load symmetrically
- Minimal axial thrust on bearings

Benefits

- ✓ Reduced bearing wear, ✓ Extended pump life, ✓ Stable operation at high viscosity
- ✓ Low vibration & noise

09. INTERNAL CLEARANCES – VISCOSITY FRIENDLY DESIGN

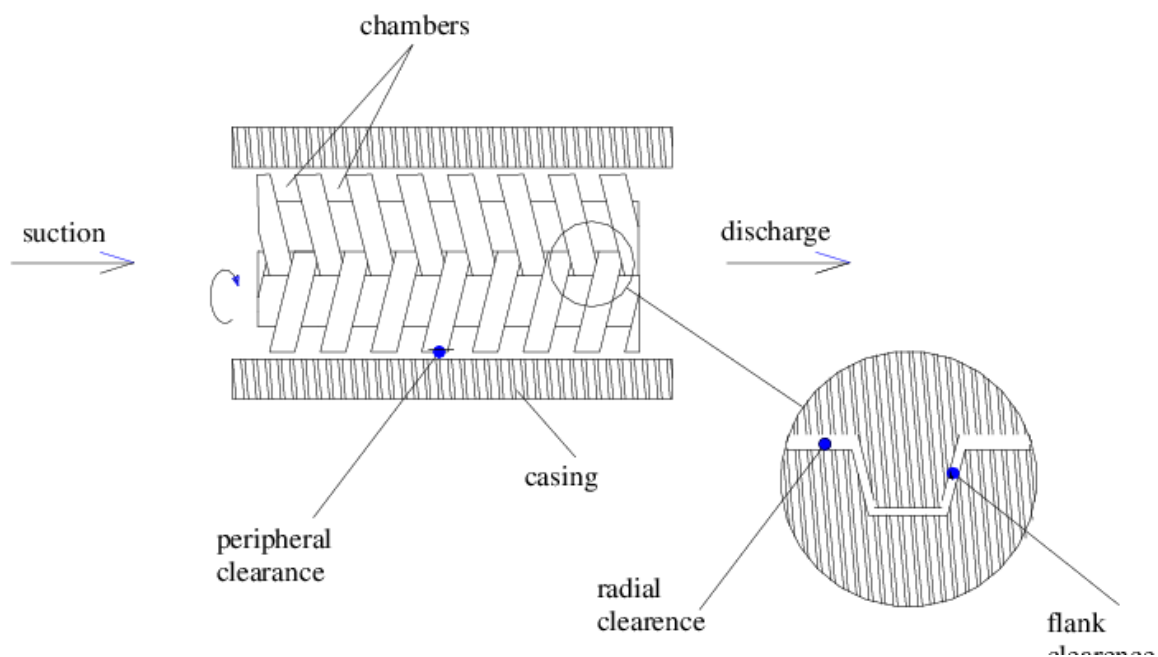


Clearance Philosophy (STN Series)

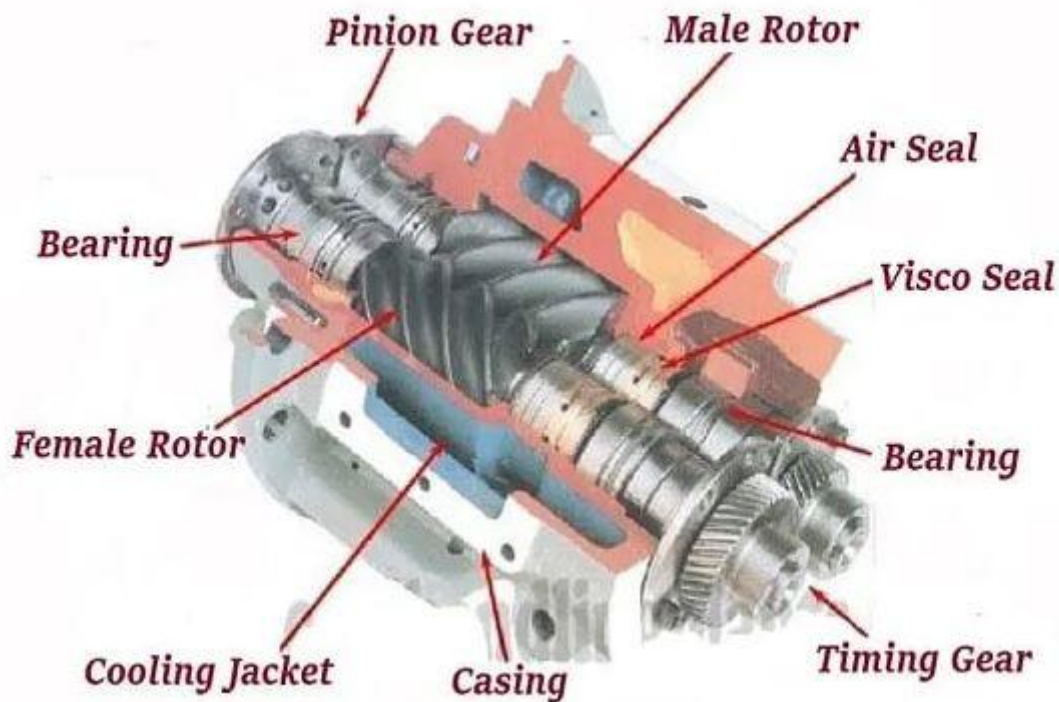
- Larger optimized clearances than high-pressure tri-screw pumps
- Designed to:
 - Reduce torque spikes
 - Prevent fluid overheating
 - Avoid excessive shear

Result

- Improved handling of **thick, sticky fluids**
- Better cold-start behaviour
- Higher reliability in low-pressure services



10. SEALING ZONE & BEARING ISOLATION



Seal Area

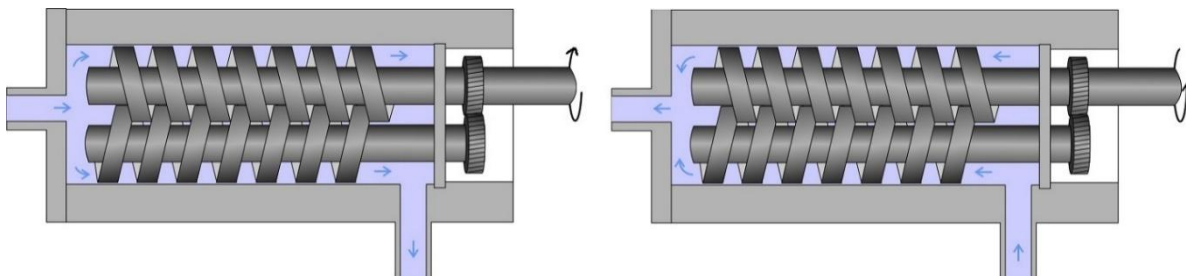
- Located outside fluid compression zone
- Protected from pressure fluctuations
- Suitable for:
 - Single mechanical seal
 - Double mechanical seal

- Stuffing box (optional)

Bearing Protection

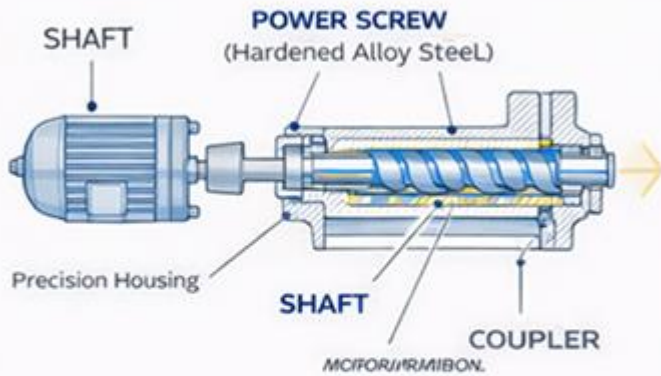
- Bearings isolated from process fluid
- Optional external lubrication
- Long service intervals

11. COMPLETE INTERNAL OPERATION SEQUENCE (SUMMARY)

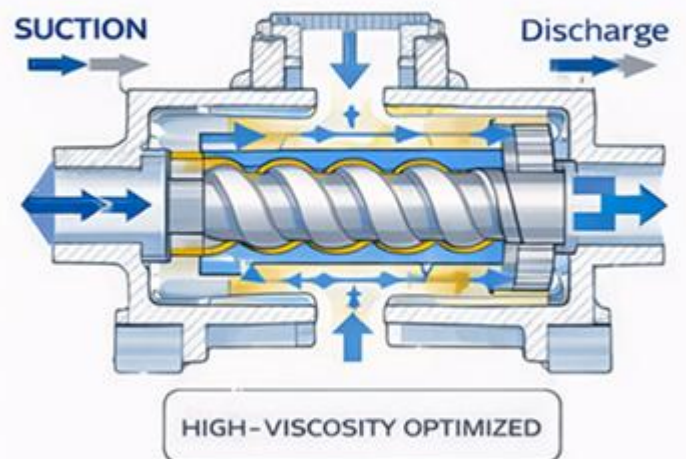


1. Fluid enters suction port
2. Cavities form between three screws
3. Cavities move axially
4. Pressure builds gradually (low pressure design)
5. Fluid discharges smoothly

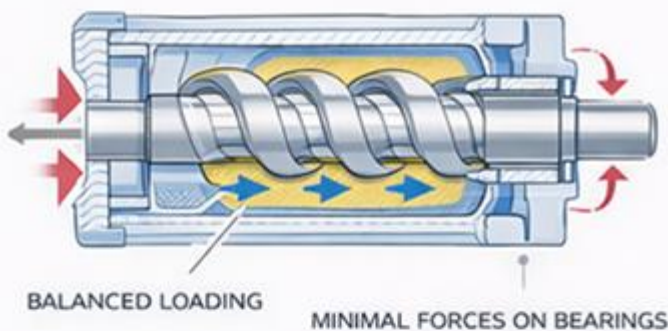
INTERNAL SCREW GEOMETRY (TRIPLE SCREW ARRANGEMENT)



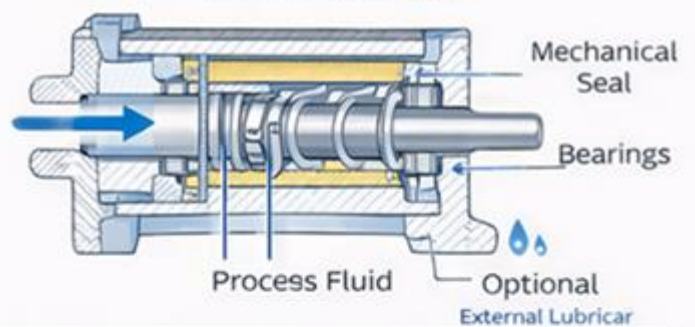
AXIAL FLOW PATH HIGH-VISCOSITY OPTIMIZED



HYDRAULIC BALANCING MECHANISM



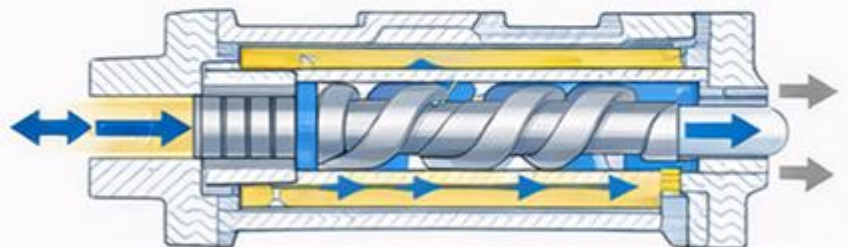
SEALING ZONE



COMPLETE OPERATION SEQUENCE

- ❶ Fluid Enters Suction Port
- ❷ Cavities Form Between Screws
- ❸ Cavities Move Axially
- ❹ Pressure Builds Gradually
- ❺ Fluid Discharges Smoothly

INTERNAL CLEARANCES (STM SERIES)



- ❶ Fluid Enters Suction Port
- ❷ Cavities Form Between Screws
- ❸ Pressure Builds Gradually
- ❹ Flow Rates Constant

12. WHY THIS DESIGN IS IDEAL FOR STM APPLICATIONS

- ✓ Handles **very high viscosity fluids**
- ✓ Low pressure, high flow stability
- ✓ No pulsation – ideal for process transfer
- ✓ Extremely low shear rate
- ✓ Quiet and vibration-free operation
- ✓ Long component life

13. MATERIALS OF CONSTRUCTION

Component	Standard Material	Optional
Power Screw	Hardened Alloy Steel	SS 316
Idler Screws	Alloy Steel	Stainless Steel
Pump Casing	Cast Iron	Carbon Steel / SS
Shaft	Alloy Steel	SS 316
Bearings	Anti-friction bearings	Heavy-duty bearings
Mechanical Seal	Carbon / Ceramic	SiC / TC
Gaskets	NBR	Viton / PTFE

14. PERFORMANCE CHARACTERISTICS

- **Flow Range** : Application dependent
- **Pressure Range** : Low pressure
- **Viscosity Handling** : Up to extremely high viscosities
- **Efficiency:** Increases with viscosity
- **Noise Level** : Very low
- **Pulsation** : Negligible
- **Shear Rate** : Extremely low

15. SUITABLE FLUIDS (STM SERIES)

- ✓ Heavy fuel oils
- ✓ High-viscosity lubricating oils
- ✓ Bitumen blends
- ✓ Polymers & resins
- ✓ Molasses & syrups
- ✓ Additives & binders
- ✓ Process oils

Not Recommended for:

- ✗ Abrasive fluids, ✗ Solids-laden slurries, ✗ Poorly lubricating liquids
- ✗ Water-like low viscosity fluids without lubrication provisions

16. SEALING ARRANGEMENTS

- Single Mechanical Seal (standard)
- Double Mechanical Seal (optional)
- Stuffing box (special execution)
- Seal flush / quench connections available

17. LUBRICATION & COOLING

- Screws lubricated by pumped fluid
- Bearing lubrication:
 - Grease lubricated (standard)
 - Oil lubricated (optional)
- External cooling jacket available for high-temperature viscous fluids

18. INSTALLATION GUIDELINES

Suction Conditions

- Flooded suction strongly recommended
- Large-diameter suction piping
- Minimum suction velocity
- No restrictions or sharp bends

Discharge Line

- Pressure relief valve mandatory
- Smooth discharge piping
- Heating jacket recommended for cold viscous fluids

19. OPERATION & CONTROL

- Flow control by speed variation (VFD)
- Pressure develops against system resistance
- Suitable for continuous duty
- Reverse rotation possible with design confirmation

20. MAINTENANCE & SERVICEABILITY

- Minimal routine maintenance
- Periodic seal inspection
- Bearing condition monitoring
- Fluid cleanliness monitoring
- Long overhaul intervals

21. TROUBLESHOOTING (SUMMARY)

Issue	Possible Cause	Remedy
Low flow	High viscosity	Reduce speed
Noise	Air entrainment	Improve suction
Seal leakage	Dry running	Improve priming
Overheating	Excessive speed	Reduce RPM

22. TYPICAL APPLICATIONS

- Fuel oil transfer systems
- Bitumen & asphalt plants
- Polymer processing
- Resin handling systems
- Chemical process plants
- Heavy oil circulation systems

23. STANDARDS & COMPLIANCE

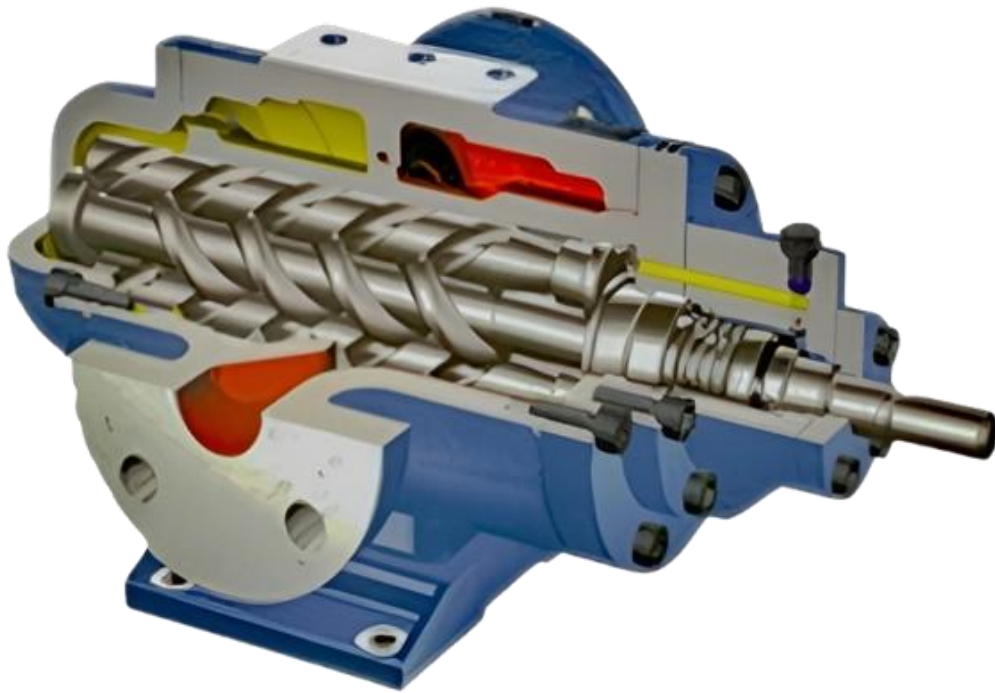
- ISO 9001 Manufacturing
- CE Compliance
- API-style design philosophy
- ATEX execution available (optional)

24. DOCUMENTATION PROVIDED

- General Arrangement (GA) drawing
- Performance curves
- Cross-sectional drawings
- Installation & O&M manual
- Spare parts list

25. SUMMARY – WHY SPEW STN

- ✓ Optimized for **high viscosity fluids**
- ✓ Smooth, shear-free pumping
- ✓ Excellent suction performance
- ✓ Reliable low-pressure operation
- ✓ Long service life
- ✓ Low noise & vibration



Contact Us

Business Hours

☎ Weekdays: 8.30AM to 5.30PM
Weekends: Closed

✉ enquiry@spewpumps.com

📍 PT14515, Persiaran Batu Gajah
Perdan 8, Taman Perindustrian Batu
Gajah Perdan, 31550, Perak,
Malaysia

