Stopper nose

Geometry

Vesuvius offers various nose profiles to match the customer’s needs.

The influence of the stopper nose geometry is shown in the chart below.

- **Entrance Step**: prevents deposition by locally altering the flow and changing the feeding angle.
- **Ripples**: located downstream of the regulation area, prevent the formation of large scale eddies. Consequently, the pressure and velocity fluctuations are reduced, improving flow stability in the mold.

**Ripple** Stopper

A stopper with a nose geometry that features:

- **Entrance Step**: prevents deposition by locally altering the flow and changing the feeding angle.
- **Ripples**: located downstream of the regulation area, prevent the formation of large scale eddies. Consequently, the pressure and velocity fluctuations are reduced, improving flow stability in the mold.

For more information on this product and on our complete package of solutions please contact our local service center:

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**Tundish Stopper**

Vesuvius offers a range of fully proven assembly systems. For precise control, the stopper body and steel rod assembly must be mechanically rigid and secure. Assemblies are custom designed for each application to provide:

- Multiple material and design options
- Highest reliability in strand control
- Proven materials for all steel grades
- Consistent gas tight assembly
- Precise, customized argon delivery
- Highest performance with minimum maintenance.

**Material selection**

For high performance, a range of special steels is available for the nose of the stopper. This is optimized for the particular steel casting conditions, ensuring that technological advances are translated into improved ease of handling with this optimized design.

**Applications.**

For added safety, the stopper body and steel rod assembly must be mechanically rigid and secure.

**Proprietary® Design**

Proprietary design technologies are used to optimize the stopper head for both thermal and mechanical performance. The result is a considerably reduced in thermal weight without a reduction in performance. The reduction in material volume allows for substantial reduction in material volume without a reduction in overall strength. The benefit is reduced weight for casting conditions. New manufacturing techniques are available for the nose of the stopper, custom-designed to meet customer target needs:

- Multiple material and design options
- Highest performance with minimum maintenance.

**Assembly design**

Assemblies are shown above. The permeable plug is designed and manufactured to accept the existing pin. The gas tightness is ensured by the compression of the gas tight assembly on the tundish stopper. The calibrated pipe specifications are custom designed for each application to provide:

- Precise control of argon flow
- Consistent, positive gas back-pressure
- Precise injection aided by argon injection.

**Argon injection**

The introduction of argon into the steel stream, the tundish stopper, reduces slag deposits in the casting mould and prevents the floatation of inclusions in the mould.

**Unique pin**

The gas tightness is ensured by the compression of the gas tight assembly on the tundish stopper. The calibrated pipe specifications are custom designed for each application to provide:

- Precise control of argon flow
- Consistent, positive gas back-pressure
- Precise injection aided by argon injection.

**CalibratedPipe® Argon injection**

For precise control, a calibrated argon system is used for argon injection into the steel stream. The most commonly used systems are shown above. The permeable plug is designed and manufactured to accept the existing pin. The gas tightness is ensured by the compression of the gas tight assembly on the tundish stopper. The calibrated pipe specifications are custom designed for each application to provide:

- Precise control of argon flow
- Consistent, positive gas back-pressure
- Precise injection aided by argon injection.

**CalibratedPipe®**

CalibratedPipe®* design

Different configurations of the stopper nose can be used for argon injection systems in the steel stream. The most commonly used design options, for example, are shown in the diagram above. The permeable plug is designed and manufactured to accept the existing pin. The gas tightness is ensured by the compression of the gas tight assembly on the stopper head. The calibrated pipe specifications are custom designed for each application to provide:

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- Consistent, positive gas back-pressure
- Precise injection aided by argon injection.

CalibratedPipe®

**CalibratedPipe® Design**

CalibratedPipe® is a patented proprietary technology used for argon systems on tundish stopper. The innovative design of the CalibratedPipe® stopper ensures a consistent, positive gas back-pressure with maximum resistance to erosion and thermal expansion. For precise argon control, a calibrated pipe is sealed into the bore of the stopper.

- **Direct injection**
- **Permeable plug**

**Argon injection**

The introduction of argon into the steel stream, the tundish stopper, reduces slag deposits in the casting mould and prevents the floatation of inclusions in the mould.

**Proprietary**

Proprietary stopper : patented improved ease of handling with this optimized design. The result is a considerably reduced in thermal weight without a reduction in performance. The reduction in material volume allows for substantial reduction in material volume without a reduction in overall strength. The benefit is reduced weight for casting conditions. New manufacturing techniques are available for the nose of the stopper, custom-designed to meet customer target needs:

- Multiple material and design options
- Highest performance with minimum maintenance.

**Materials selected**

For high performance, a range of special steels is available for this nose of the stopper. This is optimized for the particular steel casting conditions, ensuring that technological advances are translated into improved ease of handling with this optimized design.

**Application.**

For added safety, the stopper body and steel rod assembly must be mechanically rigid and secure. The result is a considerably reduced in thermal weight without a reduction in performance. The reduction in material volume allows for substantial reduction in material volume without a reduction in overall strength. The benefit is reduced weight for casting conditions. New manufacturing techniques are available for the nose of the stopper, custom-designed to meet customer target needs:

- Multiple material and design options
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**Profi lerTM Stopper : patented**

Profii lerTM Stopper : patented improved ease of handling with this optimized design.

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**High Performance Liner**

High Performance Liner is a patented proprietary technology used for argon systems on tundish stopper. The innovative design of the High Performance Liner ensures a consistent, positive gas back-pressure with maximum resistance to erosion and thermal expansion. The gas tightness is ensured by the compression of the gas tight assembly on the stopper head. The calibrated pipe specifications are custom designed for each application to provide:

- Precise control of argon flow
- Consistent, positive gas back-pressure
- Precise injection aided by argon injection.
**Tundish Stopper**

Illustration: exchangeable body with metallic rod; modular design; with welded safety collar and provision for a gas tight connection, with a safety ring that allows for easy locking and unlocking of the stopper body.

**ProfilePro® Stopper** design

Proprietary design technologies are used to optimize the shape of the stopper body to ensure that the forces encountered during casting are reduced. This results in a considerable reduction in material volume without a reduction in overall strength. The benefits are reduced weight for castings, reduction in material volume without a reduction in overall strength, and reduced energy consumption.

**Material selection**

For high performance, a range of special steels is available, with the special stopper body being made of high-strength materials.

**Assemblies**

For precise control, the stopper body and steel rod assembly must be mechanically rigid and secure. The overall configuration must be in accordance with high-performance systems.

**Gas injection**

The gas injection system is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Calibrated Pipe**

Calibrated Pipe is a defined term in the tundish stopper technology. A steel rod with a precisely controlled diameter is used to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Mould level control**

With 40 years of expertise in mould level control, Vesuvius Technology offers a complete solution. With 40 years of expertise in mould level control, Vesuvius Technology offers a complete solution.

**SERT technology**

SERT is a specialist in implementing the complete control loop including the mould level sensor, advanced adaptive controller, and electrically driven stopper valve. The entire control loop under the responsibility of a specialist supplier.

**Unirod™ stopper**

The Unirod™ stopper is a patented design for tundish stoppers. It is designed to ensure a consistent gas tight assembly.

**Calibrated Rod**

Calibrated Rod is a patented design for tundish stoppers. It is designed to ensure a consistent gas tight assembly.

**Direct Injection**

For precise control, a calibrated pipe is inserted into the stopper body. The pipe is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Porous plug**

The porous plug is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**High Performance Liner**

The High Performance Liner is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Termination**

The termination is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Argon Injection**

The introduction of argon into the steel means that the tundish stopper, reduces slags deposits to the mould cavity and promotes the fluidity of the molten steel.

**Calibrated Rod® Argon Injection**

In precise control, a calibrated pipe is inserted into the stopper body. The pipe is designed to ensure that the gas flows into the molten steel, promoting the formation of inclusions and promoting the fluidity of the molten steel.

**Vesuvius precision control (VPC)**

Vesuvius Precision Control (VPC) is a patented technology for tundish stoppers. It is designed to ensure a consistent gas tight assembly.

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**Vesuvius precision control (VPC)**

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**Tundish Stopper**

Illustrative graphic shows a refractory body with metallic route to ensure thermal shock, combined with a unique range of coupling systems for both boshhead and fully hooded or valveless applications.

**Profile**

Design technology and features for high performance, optimal quality and low weight. The key components are:

- Metallic insert
- Profiler design
- Body
- Slag line mix
- Antistick coating
- Erosion resistant mix
- Calibrated pipe

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**Material selection**

For high performance, a range of special steels is available for the nose of the stopper, customised for the particular steel composition or quality conditions. New technological advances in the production of high purity low carbon steels have enabled high purity low carbon liners to be formed on the stopper-head.

**Assemblies**

For precise control, the stopper body and steel rod assembly must be mechanically rigid and secure. The various stages of high power assembly systems:

- *Spinal™* stopper
- *Argorod™* stopper
- *Unirod™* stopper

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**Gas injection**

The introduction of argon into the steel stream, via the tundish stopper, reduces slag deposits in the cast- ing mould and promotes the flotation of inclusions in the melt.

- Argon injection
- Direct injection
- Permeable plug

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**Argon Injection**

For precise control and a substantial gasㅅ

- Argon injection
- Direct injection
- Permeable plug

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**Calibrated Pipe**

For precise control of gas flow.

- Consistent, positive gas back-pressure
- Gas injection without risk of air aspiration

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**Calibrated Pipe Technology**

Different configurations of the stopper nose can be used for argon injection and the stopper. The most commonly used stopper injection and permeable plug, are shown above. The permeability of the stopper metallic rod is determined by the ceramic plug and the metallic insert pressed in the bore of the stopper.

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**Argorod™ Stopper**

- The most commonly used assembly system for reliable argon injection.
- **(*) Argorod™ Stopper: patented**

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**Unirod™ Stopper**

- This is the optimum argon injection system for precision control of argon injection. The stopper metallic rod is designed and shaped by the ceramic plug and the metallic insert pressed in the bore of the stopper.

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**Calibrated pipe**

- Compression of the gas stream and dissipation by the ceramic plug. The gas tightness is ensured by the compression of the pressure washers and the calibrated pipe is secured into the stopper body.

- **(*) Calibrated Pipe Technology: patented**

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**Calibrated® Stopper**

- The original assembly system for reliable argon injection is designed and shaped by the ceramic plug. **(*) Calibrated® Stopper: patented**

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**Mould level control**

With 40 years of expertise in mould level control and more than 500 strands equipped with their systems, SERT is a specialist in implementing the complete control loop including level sensor, advanced controller, and electrically driven stopper. The entire control loop under the responsibility of a single expert supplier.

- Electrically driven stopper valve DEM9M
- SERT level control systems feature:
  - Various sensor choices, including suspended and ledge type full digital eddy-current sensors.
  - An advanced adaptive controller to match all major perturbations that can occur during casting sequence.
  - An electrically driven stopper valve DEM9M.
  - Actuators, that guarantee high, consistent performance with minimum maintenance.

- **MQS120M (depicted below), or DEM9P servo-actuators, that guarantee high, consistent performance with minimum maintenance.**

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**Vesuvius Precision Control (VPC)**

- Multi material and design options to meet customer target needs:
  - Precise, customized pack delivering:
    - Produce target needs
    - Customised argon delivery
    - Customised gas back-pressure

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**SERT**

SERT is a specialist in implementing the complete control loop including level sensor, advanced controller, and electrically driven stopper.

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**Argorod™ Stopper**

- Argon injection is designed and shaped by the ceramic plug. The gas tightness is ensured by the compression of the pressure washers and the calibrated pipe is secured into the stopper body.

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Stopper nose

Geometry

Vesuvius offers various nose profiles to match the customer’s needs.

The influence of the stopper nose geometry is shown in the chart below.

This chart compares the resulting steel flow for a given stopper lift for two stopper nose shapes using the same nozzle -- hemispherical and conical.

Ripple™ Stopper

A stopper with a nose geometry that features:

• Entrance Step: prevents deposition by locally altering the flow and changing the feeding angle.

• Ripples: located downstream of the regulation area, prevent the formation of large scale eddies. Consequently the pressure and velocity fluctuations are reduced improving flow stability in the mould.

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