



TAPPI PEERS

Working Towards a Safer
Recovery Boiler Operation

Speaker Name

Month ##, 20##



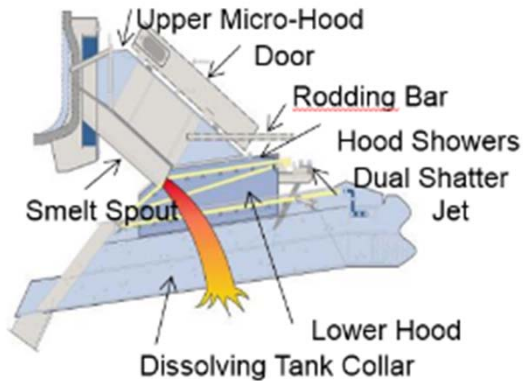
Contents

- Smelt Spout Systems
 - Hood systems
 - Modern hood system improvements
- Smelt Spout Robot
 - Robot configurations
 - Video demonstration
- Liquor Station with Automated Port Rodder
 - Operations and maintenance improvements
 - Performance improvements
- Automated Port Rodder
 - Design features
 - “On-the-run” maintenance
- Questions and open discussion

Smelt Spout Systems

Standard Smelt Spout System

Concept



Installed



In Service



• SAFETY

- Increased Operator Protection with Fully Enclosed Micro-Hood System
- Dual Shatter Jets with BLRBAC recommended 2nd jet improves safety during heavy smelt runoffs
- Easier Spout Cleaning With Steep Angle
- Inserter Spout & Built -In, Pre-Poured Refractory Seal Box for Superior Mounting Interface
 - Reduces Risk of Smelt Leaks
 - Minimize Wear to Opening Tubes

• OPERATION

- Improved Shattering, Quiet Spout Deck
- More Consistent & Steady Smelt Flow
- Reduces Fuming , Tramp Air and Ext ra Load on Vent Stack Scrubber
- Highly Adjustable Shatter Jets
- Easily Accessible Shower Bars for Mid-Cycle Cleaning or Replacement
- Adaptable to most boilers existing recovery boiler fleet

• ROI

- Reduced Time & Cost to Replace Spouts
 - Significant Reduction in Shattering Steam Usage
 - ShatterMax™ Nozzles Rated for ≥ 400 lbs/hr Each
- ❖ **Typical payback ≤ 1 Year; Estimated \$70k – \$300k Steam Savings Per Year**

Large Hood Systems



Large Hood Systems

- **Typical Challenges**
 - Many internal components for Smelt to collect on →
 - Support bars, shower bars, etc...
 - Requires a lot of hood shower water
 - Shatter jets mounted far away
 - Excessive hood wear
 - Corrosion on cooling water lines
 - Poor accessibility for manual cleaning



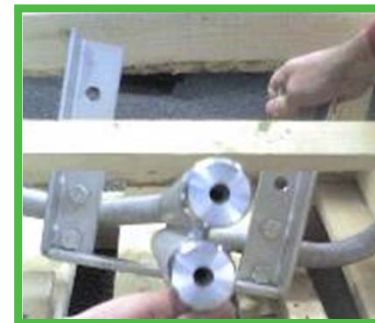
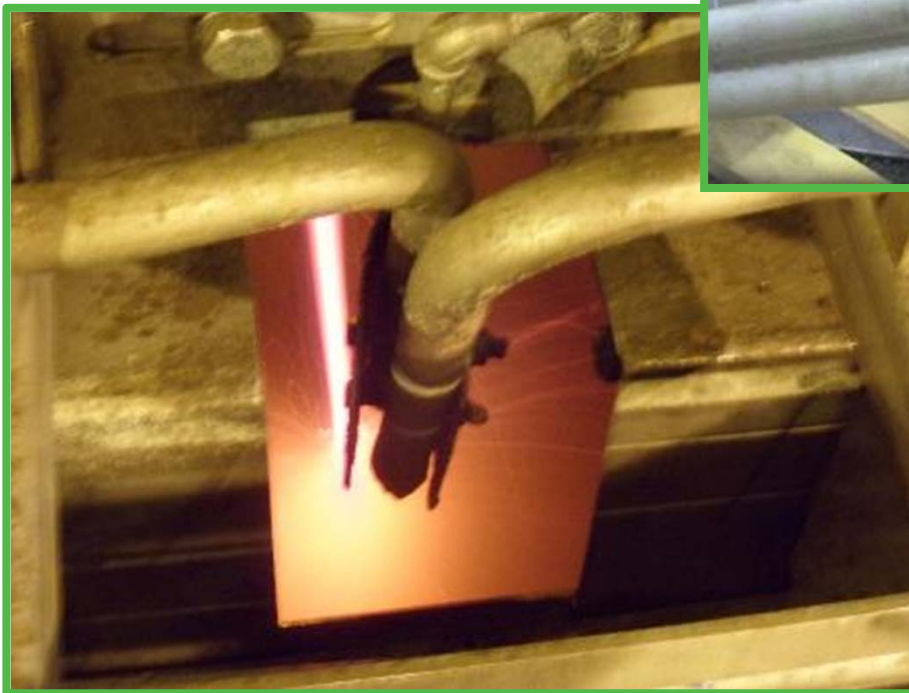
Modern Micro-Hood Spout Systems

- Benefits
 - Easier access to spouts for manual cleaning
 - Easier replacement of spouts
 - Minimal hood shower water
 - Minimal internal ledges
 - Cooling water lines not exposed to smelt
 - Shatter jets are closer to the spout resulting in a more downward angle of shattering. (Reduces Hood Wear!!!)
 - Minimizes tramp air intake



Modern Micro-Hood Spout Systems

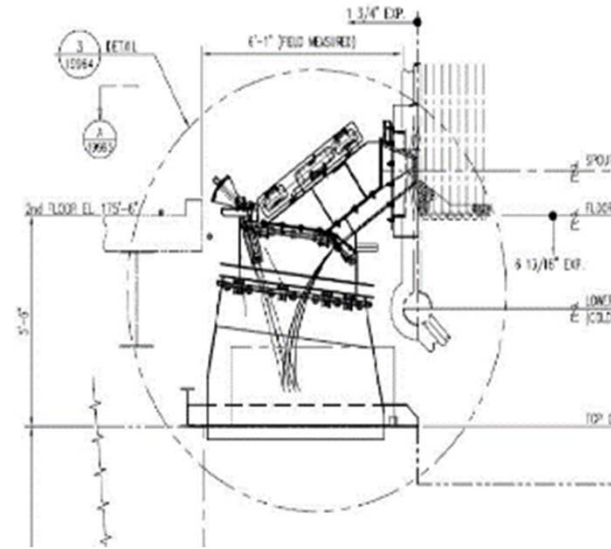
- Other modern safety related product upgrades...
 - Dual shatter jets
 - Externally mounted shower bar headers
 - More reliable mounting interfaces for the smelt spouts.



Large Hood



Micro-Hoods



Smelt Spout Robot

DeckHand™ Smelt Spout Robot

Concept



- **SAFETY**
- Greatly reduces the risk of operators getting injured from splashes of green liquor or smelt
- Cleans spouts, hoods & shatter jets
- Robot camera: operators can visually inspect spouts from safe control room
- Safety gates designed to stop robot if any personnel enters the spout deck
- Possible future upgrades
 - Robot installation of refractory plug
 - Robot adjustment of shatter jet

Installed



- **OPERATION**
- Standing or hanging robot design
- One robot for all spouts (*Typical*)
- Fully automatic, pre-programmed sequences
- Several Cleaning Programs
 - Gentle cleaning (Normal)
 - Thorough cleaning
 - Open plugged spout
- Robot can collect smelt samples
- Water wash lance option for online cleaning of dissolving tank collars

In Service

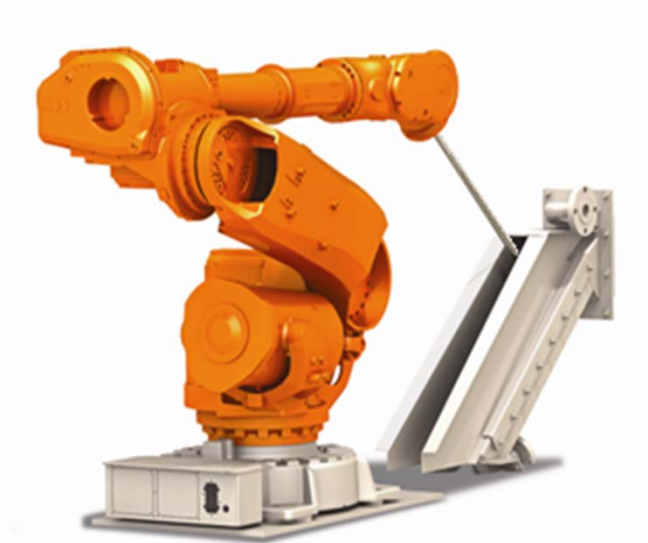


ROI

- Minimize injuries to operators on spout deck
 - Allows operators to spend more time and focus on other operational tasks
 - Spouts are cleaned more frequently resulting in more consistent RB operation
 - Better cleaning of hood internals, can increase life span
- ❖ ***Payback can be developed through improved safety and potential for improved personnel productivity.***

Smelt Spout Robot

- Less personnel at the smelt spouts
- Standing or hanging, depending on spout deck layout



Programmed for safe and thorough cleaning

- Fully automatic
 - Pre-programmed sequence
- Several cleaning programs
 - Gentle cleaning (normal)
 - Thorough cleaning
 - Open plugged spout
- The operator is in control
 - What cleaning program to use
 - Where to clean (set priority)
- Less wear on the spouts
 - The robot tool does not touch the spout
 - Compare to manual cleaning using heavy tools...



Optical safety barriers around robot

- Optical barriers - open work environment
 - Unobstructed equipment visibility
- Escape routes always open
- Two barriers:
 - Break outer barrier: Warning (robot aborts and returns to base position)
 - Break inner barrier (closest to the robot): Stop (robot immediately freezes)



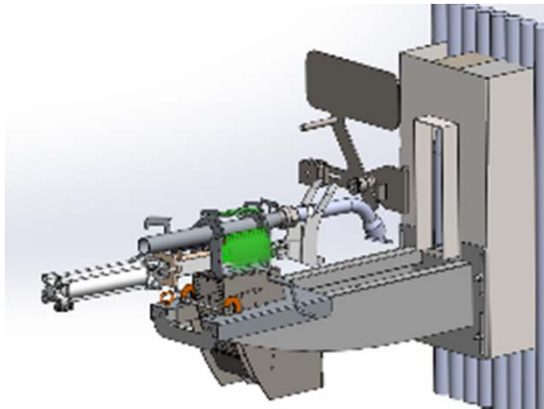
Video Demonstration



Liquor Station with Automated Port Rodder

Liquor Sprayer Station Design and Optimization

Concept



Installed



In Service



• SAFETY

- Limited operator exposure to furnace
 - Station retractable outside furnace
 - Safety door protection from opening
 - Ready signal for spraying to start
- Improved operator working conditions
 - Light weight design and ergonomically positioned working heights
 - Auto-cleaning cutter reduces amount of manual cleaning required
- Simplified GunnersMate™ nozzle change out
 - Connection designed for easy thread engagement during change out (spanner wrench only)

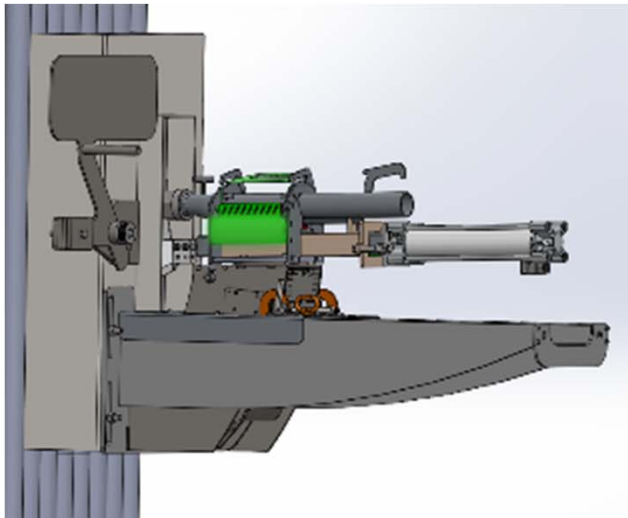
• OPERATION

- Improves liquor distribution consistency
 - Automatic nozzle cleaner improves bed control and reduces carry-over
 - Nozzle self alignment installation
 - Easy spray positioning for optimized liquor distribution
 - Nozzle centered in opening improves nozzle life
 - Adaptable for different style nozzles
 - Maintenance agreement available for insured reliability
- Adaptable to most boilers in recovery boiler fleet

• ROI

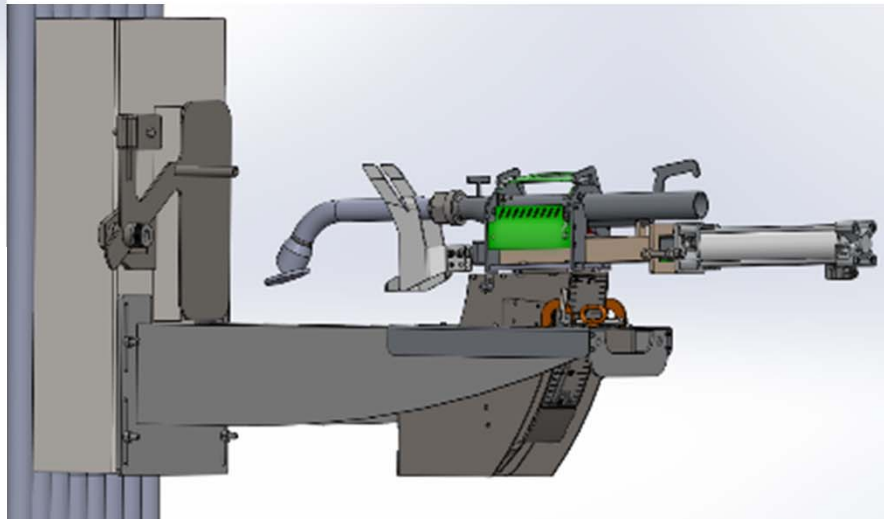
- Incident reduction
- Improve equipment life (nozzle, hoses)
- Improve smelting efficiency
- Reduce carry over/water wash
- Chemical use reduction
- Optimized liquor combustion
- Low capital investment
- Low spare part inventory
- ❖ **Payback reported ≤ 1 Year by customers driven through safety and performance improvements**

Liquor station insert and retract from opening

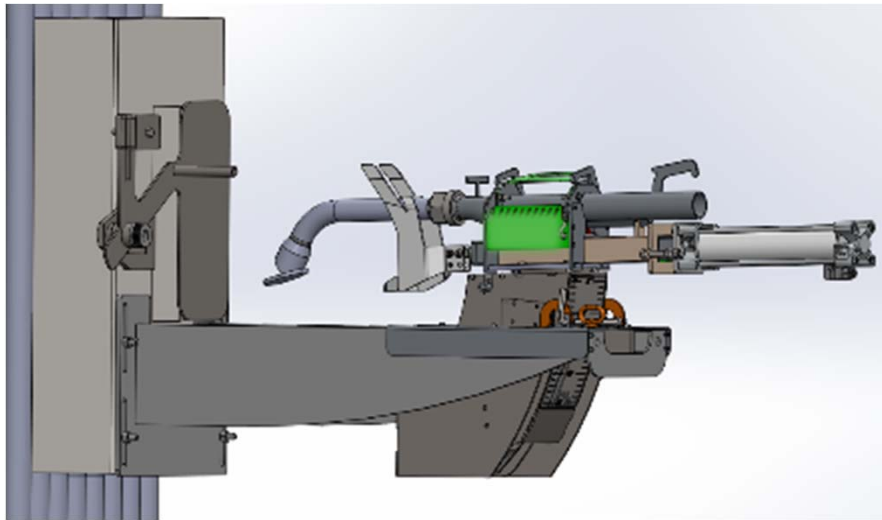


- Operator repeats same 3 steps to re-insert sprayer in firing position
- No time needed on hose, spray position (angle/penetration) or any heavy/backward lifting

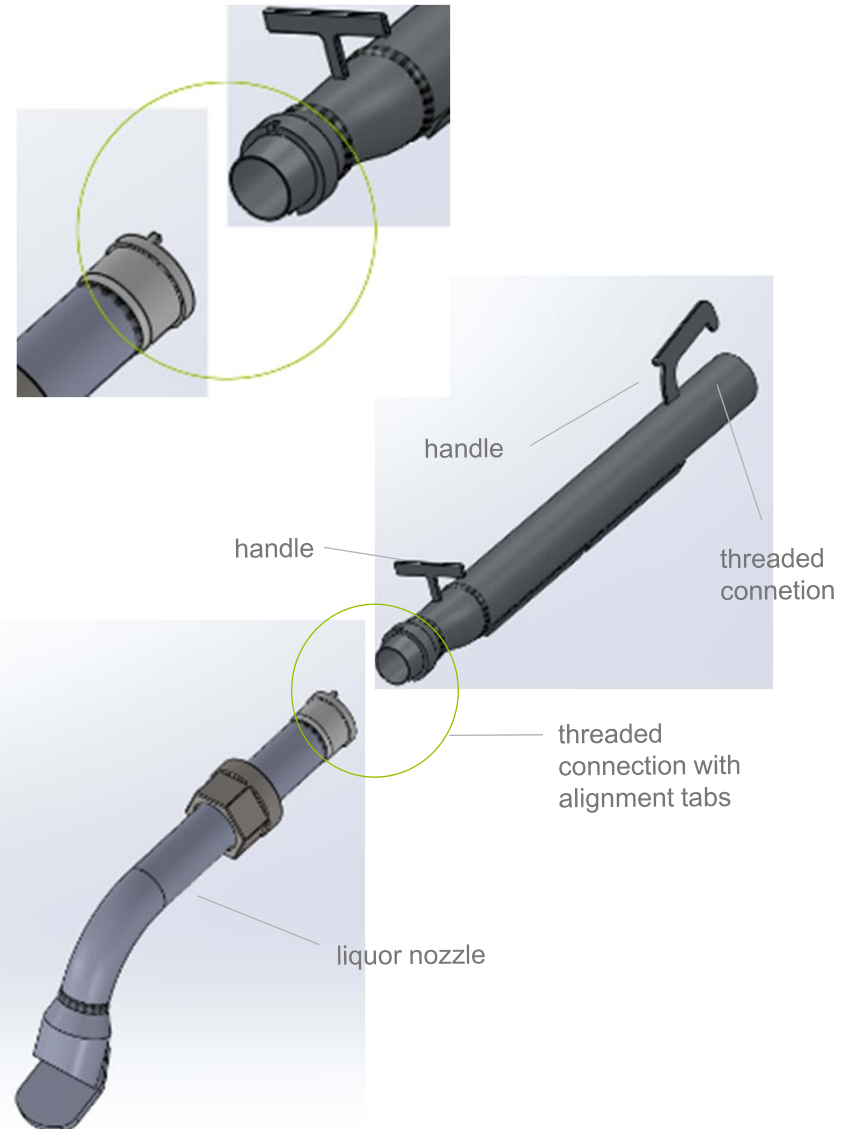
- Operator has 3 simple step to remove sprayer from firing position after liquor shut off, minimizing time in front of opening



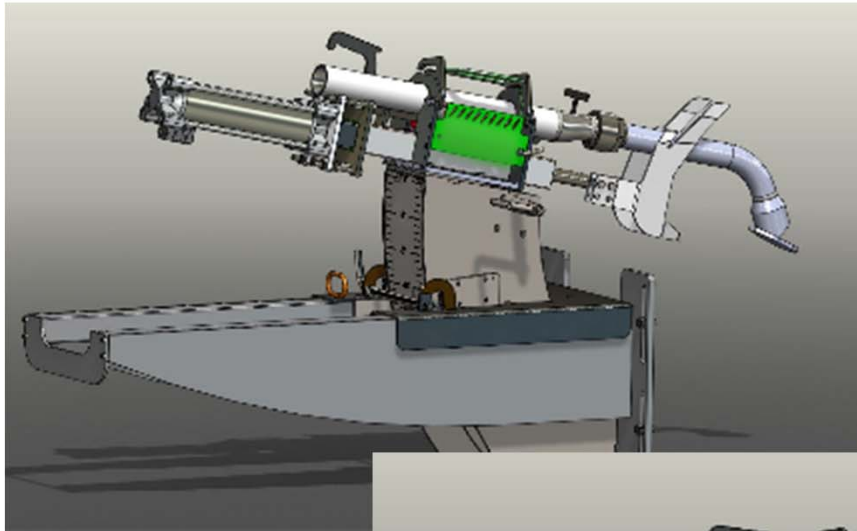
Liquor station easy nozzle change in safe environment



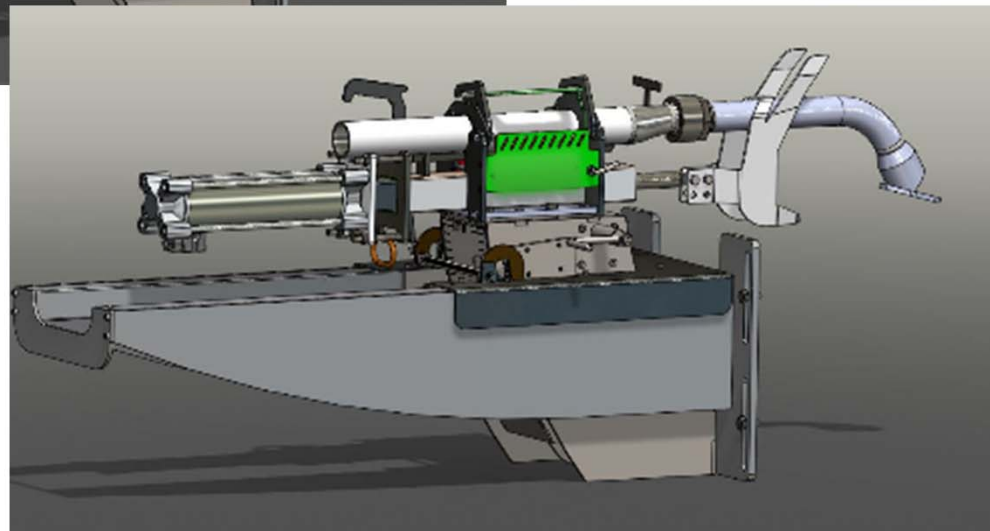
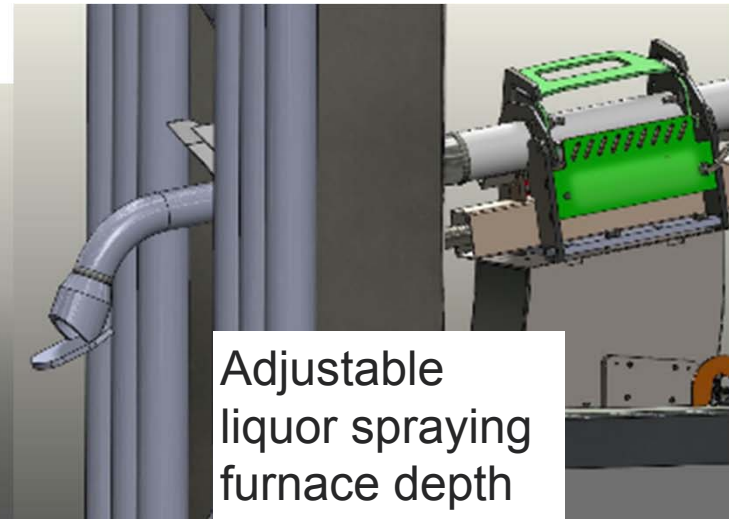
- Operator can now change the nozzle with minimal muscle stress
- Change-out made directly on the station with patented simple release connection
- Ensures nozzle alignment and leak free with no gasket material needed



Liquor station is adjustable with measurable precision



Adjustable liquor spraying angle



All adjustment could be done in both inserted or retracted position

Liquor station assists in cleaning nozzle and opening port

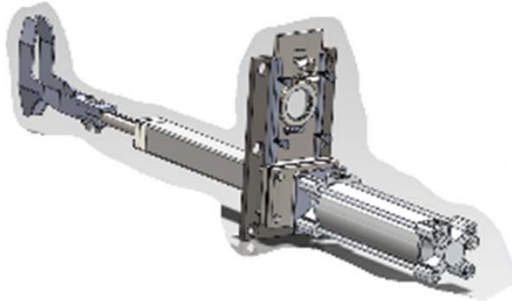


- Operator assisted in keeping the opening and the nozzle tips clean (beer can/splash plate).
- Minimizes operator exposure in front of openings.
- Saves time in the opening with less to clean between operator rounds

Automated Port Rodder

Roddingmaster® - Automated Port Rodder

Concept



Installed



In Service



- **SAFETY**

- Limited operator exposure to furnace
 - Slide gate seals opening
- Improved operator working conditions
 - Light weight units
 - Large observation port
- Control box easy access for remote isolation
 - Simplified removal of rodder “on-line”
 - Cylinder and cutter designed with fewer installation bolts

- **OPERATION**

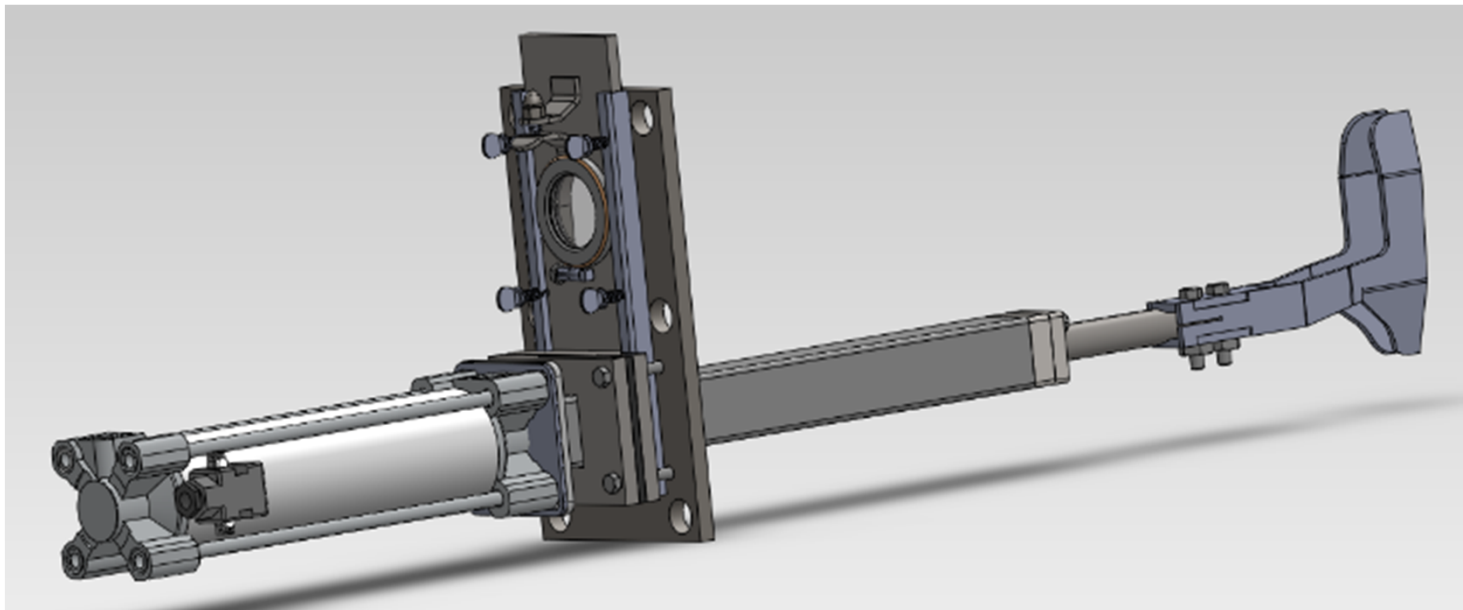
- “On-the-run” safe cutter change out
- Engineered one punch cutter
- Large port visibility allows for easy manual touch-up port cleaning
- Quick maintenance replacement
- “Operational” remote signal available for cylinder operation
- Maintenance agreement available for insured reliability
- Adaptable to most boilers in fleet

- **ROI**

- Improved air distribution consistency
- Improved rodder availability and reliability
- “On-the-run” cutter change-up
- Simple design – low part inventory
- Stainless steel design for improved life
- ❖ ***Payback reported ≤ 1 Year by customers driven primary through safety***

Port rodder cleaner

- Port rodder provides automated assistance for the operator in maintaining all air port cleaning to promote better air distribution with a more consistent flow.
- Simple one punch design of port rodder minimizes maintenance, simplifies operation and reduces spare parts list.

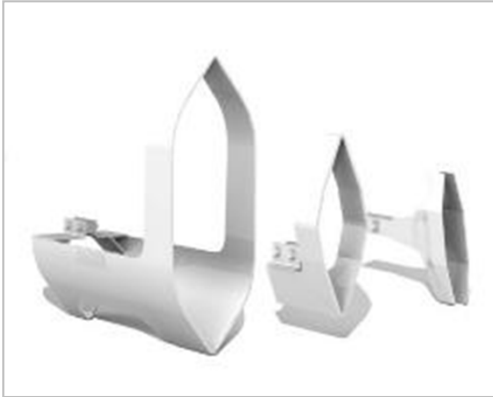


Single punch port rodder – “on-the-run” cutter replacement

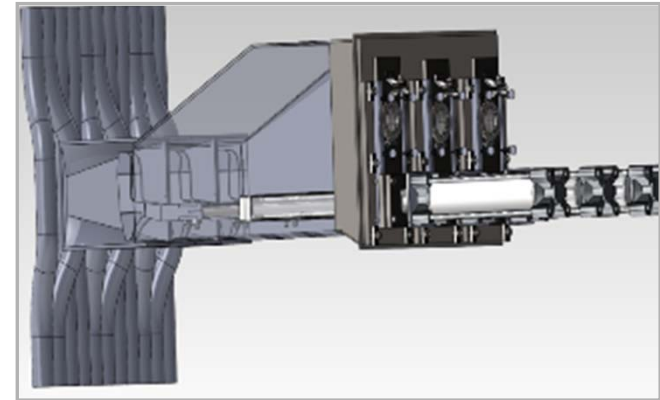


- Operator can now change the cutter on the run with minimum exposure time in front of opening.
- The “on-the-run” version of the port rodder allows the operator to easily open sliding door, remove the rodder assembly with the cutter and change it outside of the furnace with the sliding door in closed position out of harms way.
- The gate can also be left closed and operator can use the sight glass for manual rodding port until unit is repaired or replaced.

Port rodder for all air-level openings



- Rodders and cutters available in all ports, primary, secondary and tertiary.



- Each port has it's own dedicated rodder and controlled in banks with control box units

