

Easytork

**The Best Actuator for Reducing Fugitive
Emissions from Pneumatic Systems**

Emissions Impact of Pneumatic Systems

What is the problem

- According to the EPA, pneumatic instrument systems such as pneumatic actuators powered by high-pressure natural gas are often used across the natural gas and petroleum industries for process control
 - ▶ The constant bleed of natural gas from these controllers is collectively one of the largest sources of methane emissions, estimated at approximately 51 billion cubic feet (Bcf) per year in the production sector with 400,000 pneumatic devices, 14 Bcf per year in the transmission sector with 85,000 pneumatic devices, and <1 Bcf from processing with 13,000 gas pneumatic devices
- Pneumatic actuators are utilized in every facet of the oil and gas industry – upstream, midstream, downstream. When powered by high-pressure natural gas, the amount of fugitive emissions from pneumatic actuators are a function of:
 - ▶ Constant bleed in static state: Degradation of sealing mechanism within actuator
 - ▶ Bleed in dynamic state: Volume of air usage required to generate sufficient torque to turn a valve

What is the solution

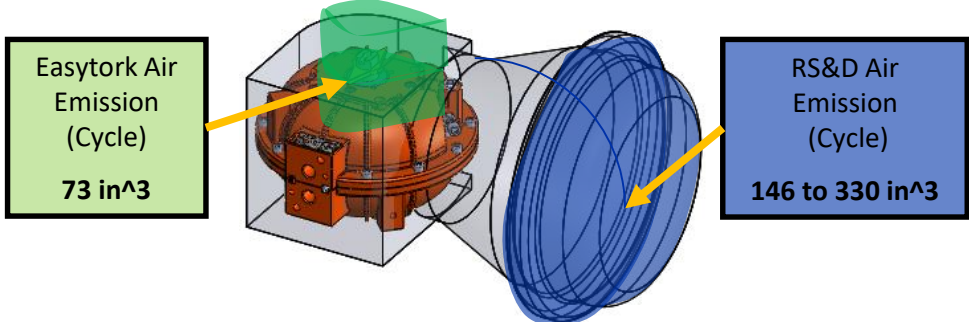
- Electric actuator or pneumatic actuator powered by instrument air would result in zero emission. However, the economic cost of creating the infrastructure required versus the readily available source of natural gas, pneumatic actuators powered by natural gas will still be the reality on the ground
 - ▶ Similarly, electric cars would be the ideal environmental solution, but given the prevalence of oil based energy grid, gasoline powered cars is the reality on the ground. Significantly improving the MPG efficiency of cars, without sacrificing (or even improving) the performance and price will align the environment with the market driven supply-demand curve
- Easytork's solution for reducing fugitive emissions is to provide an actuator that is environmentally better, operationally and economically sustainable, and scalable
 - ▶ *Environmental* – Easytork reduces fugitive emissions by up to 75% on control valves during its dynamic state maintain zero bleed at static state, even after extended usage
 - ▶ *Operational* – Easytork easily fits into the existing system powered by natural gas, with better process control metrics even in the most challenging control valves applications
 - ▶ *Economical* – Easytork provides environmental and operational benefits with lower upfront and overall operating costs

Easytork's Patented Design = Significant Efficiencies in Emissions / Air Consumption

No Springs in Easytork = Significant Reductions in Air Consumption and Emissions

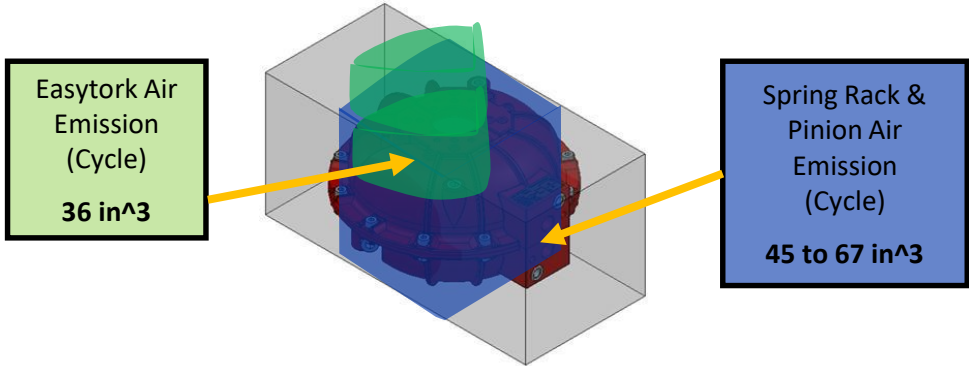
- Pneumatic actuators in natural gas or petroleum industries are often powered by high-pressure natural gas
- The highlighted gas volume in blue and green will be released to environment with each full actuator cycle

Easytork vs. Rotary Spring & Diaphragm for Control Valves:



For same output, Easytork dispenses 1/4th to 1/2 the amount of gas on control valves

Easytork vs. Spring Rack & Pinion for On/ Off Valves:

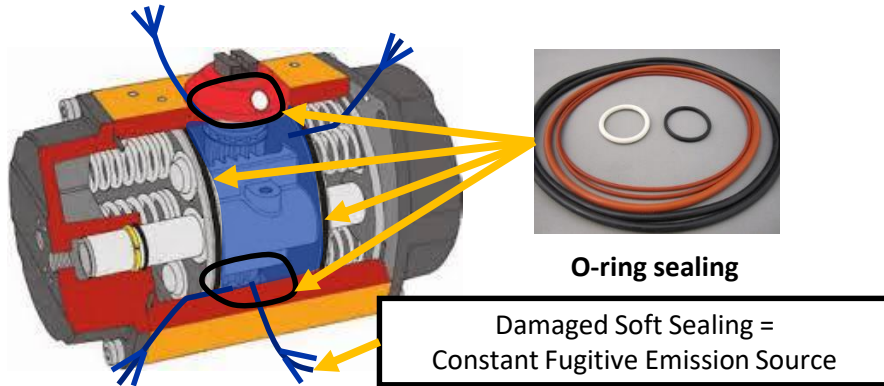


For same output, Easytork dispenses 1/2 to 2/3rd the amount of gas on on/off valves

No Springs = Static Fugitive Emissions Eliminated

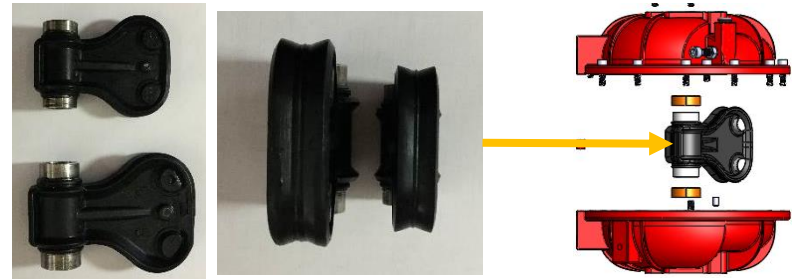
Constant Emissions Even When Actuators are Not Moving

- Compromised soft seals in actuators will constantly bleed air / natural gas
- O-rings are prevalently used in rack & pinions as seal design. O-rings are not heavy duty and are designed for static sealing, not the dynamic sealing that actuators require. They typically start wearing out at 200,000 cycles



Easytork Zero Bleed Even After 4,500,000 cycles at Static State

- Easytork uses a heavy duty vane lip seal to prevent any bleed-by



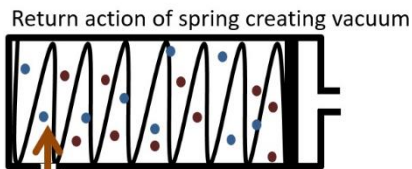
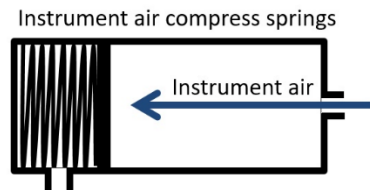
Vane lip seal w/ minimal wear @ 4,500,000 cycles

Easytork's heavy duty lip seal allows zero bleed even after high usage

Actuator Seal Design

Springs Worsen Chance of Fugitive Emission

- Springs in actuator weaken the seal by vacuuming in environmental debris that attack the soft seals



Compromised O-ring



Vacuumed environment damages actuator soft sealing

- Environmental debris
- Environmental atmosphere (ie. moisture / corrosive air)

Internal of actuator with springs pulling in debris

Easytork Actuator Has No Springs To Compromise Actuator's Zero Bleed

- With no springs to vacuum in environmental debris, Easytork's soft seals are never exposed to the environmental debris



Application with Easytork actuators (in red) driven by natural gas

Spring Effect On Seal

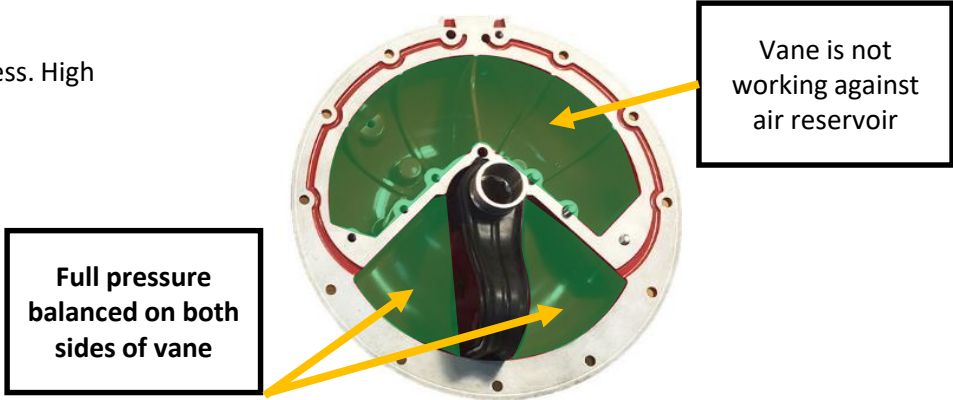
Control Valve Fugitive Emissions Reduction

Actuator Stiffness Results in Better Control Valve

- High air pressure, on both sides of the actuator vane provides exceptional stiffness. High stiffness helps withstand change in process or air supply

Actuator Stiffness Results in Reduced Air Consumption and Fugitive Emissions

- The less the actuator has to move, the less gas is emitted into environment

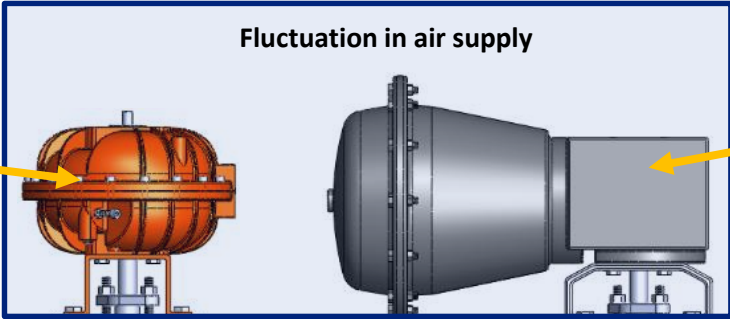


Springs Worsen Fugitive Emission When Control Valve is Powered By Natural Gas

- Spring based actuators have to constantly move to compensate for air supply or process pressure fluctuation. If the control valve package is powered by natural gas, this results in constant fugitive emission. Air reservoir designs mitigate this problem

No Movement, No Emission

Actuator is pressure balanced prior to fluctuation in air supply



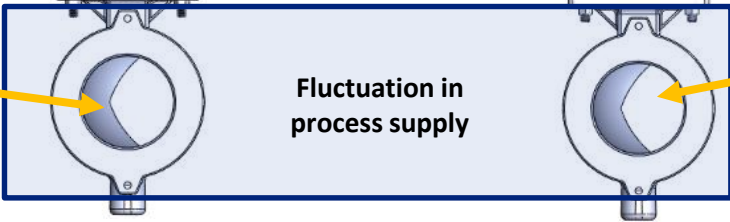
Fluctuation in air supply

Results in Emissions

Actuator has to move to re-balance spring torque

Minimal Movement, Reduced Emissions

High actuator stiffness hardens valve movement away from set point



Fluctuation in process supply

Results in Emissions

RS&Ds have low stiffness, actuator has to move to re-balance to set point