

AEROSOL PRODUCTION & FILLING TECHNOLOGY

Jim McBride

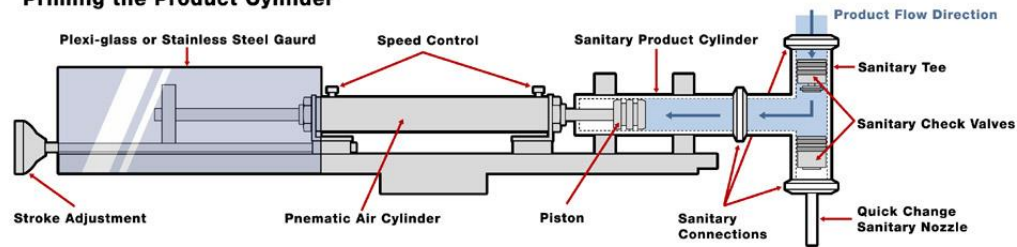
MBC Aerosol Filling Machinery

SATA Aerosol 101 SPRING 2015

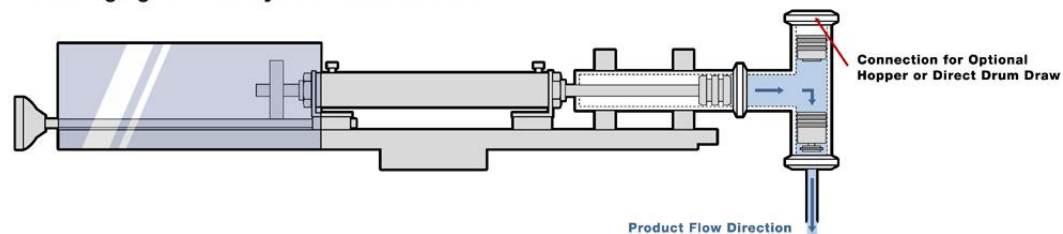
AEROSOL FILLING PROCESS

POSITIVE DISPLACEMENT PRODUCT FILLING

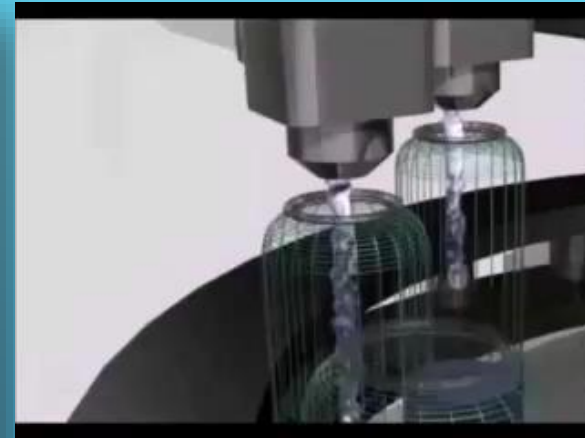
Priming the Product Cylinder



Discharging Product Cylinder to container



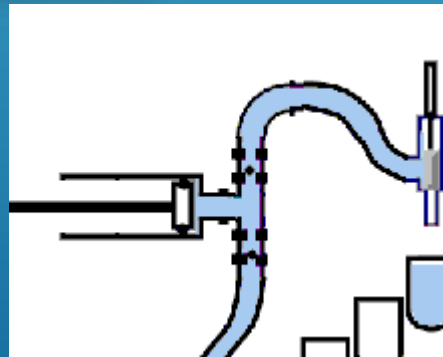
Product Metering Pump & Nozzle



Fill Nozzles



Fill Pump Rack



Benefits

- Fill accuracy typically + or - 1/2 ml
- Capable of filling many different product types and viscosities up to 50,000 cps

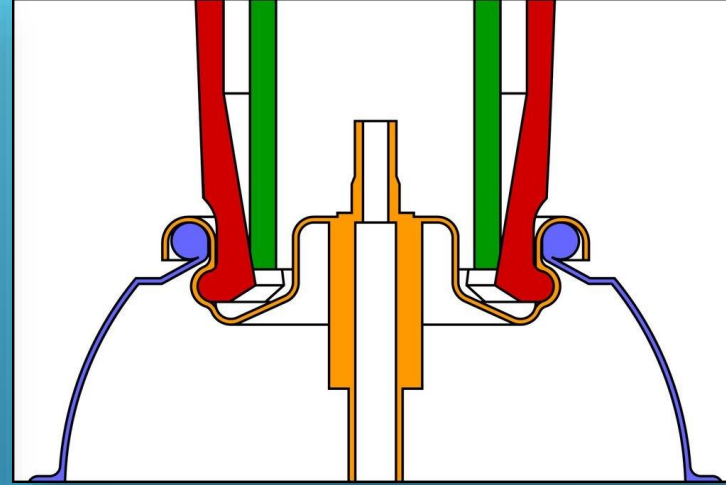
Other Filling Methods:

Time over Pressure / Gravity / Mass flow / Net Weight

STANDARD 1" INTERNAL CRIMPING OF AN AEROSOL VALVE



Gasket compression



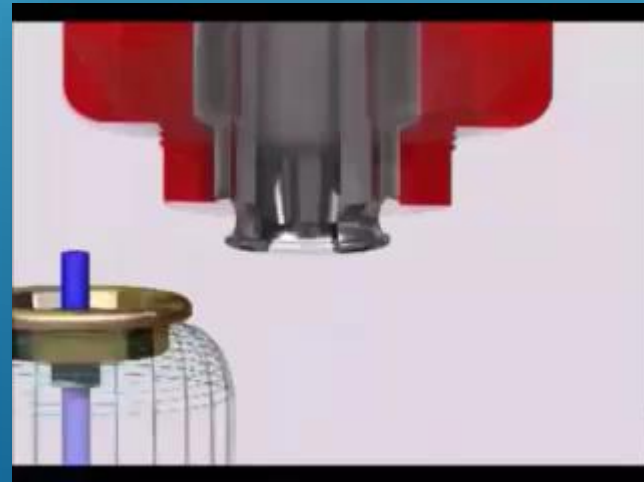
Aerosol Valve to can Crimp



Quality Control Crimp Gauges

Notes:

- Proper Gasket Compression if used
- Proper Crimp specifications from vendors
- Pedestal Height for actuator interface



Stem Height Gauge

THROUGH THE VALVE GASSING T.T.V.

Gassing Through the Aerosol Valve stem

Method:

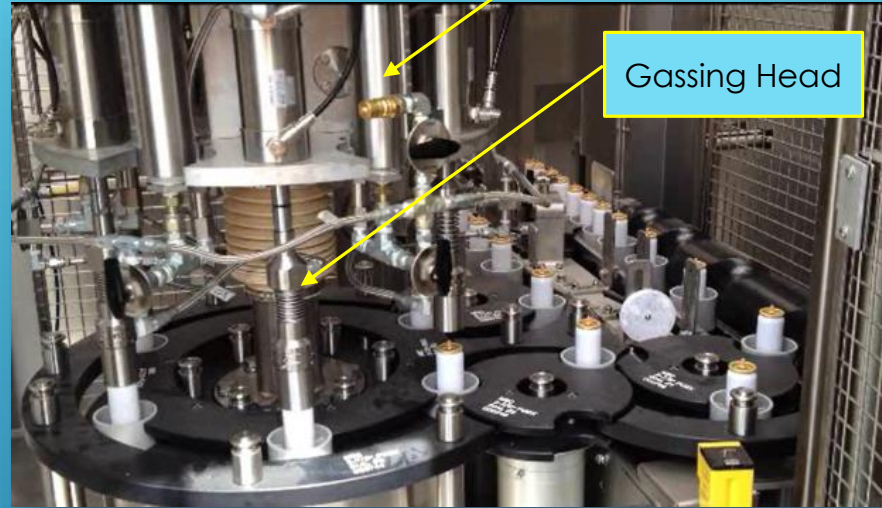
- The head lowers onto the crimped can sealing on the aerosol valve stem or pedistal
- Gas is injected via a gas metering pump into the aerosol valve either by hydraulic force or mechanically opening the aerosol valve
- The head raises off the aerosol valve which allows the valve to close
- Filling through the stem only or through and around the stem are common methods

Pros:

- Only 1/4 to 1cc gas loss between the aerosol valve and gassing head each cycle
- On-Line gas blending past and present (Gassing the can more than once with 2-3 gasses)
- Maintenance is minimal (O-ring or a seal)
- Modern Valves Fill at 100cc per second

Cons:

- Some metered valve do not work



Multi Head High Speed Rotary T.T.V. Gasser



Single Head Through the Valve Gassing station

UNDER THE CUP GASSING

Gassing and Crimping with the same station

Method:

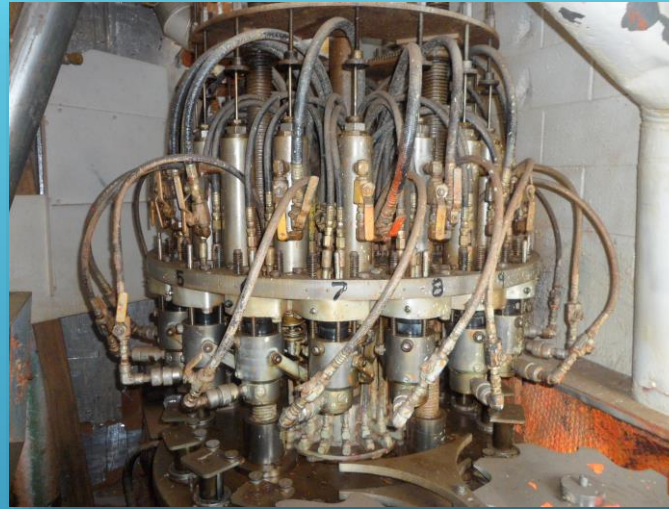
- The Head Seals on can dome
- Vacuum is pulled to evacuate moisture and atmospheric pressure that may corrode the can or contaminate the product
- The aerosol valve is lifted from the can top opening
- Gas is injected around the aerosol valve into the aerosol can from a metered injection pump
- The Aerosol valve is pushed back into the can top opening for the crimping process

Pros:

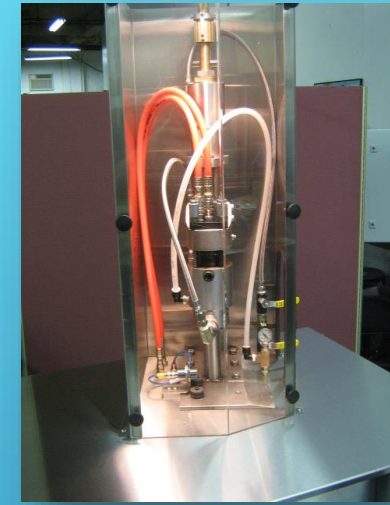
- Faster gassing than some early slow filling Through the valve gassing aerosol valves which limited production speed
- Meter dosed valves can be gassed
- Gassing button on valves is faster in some cases

Cons:

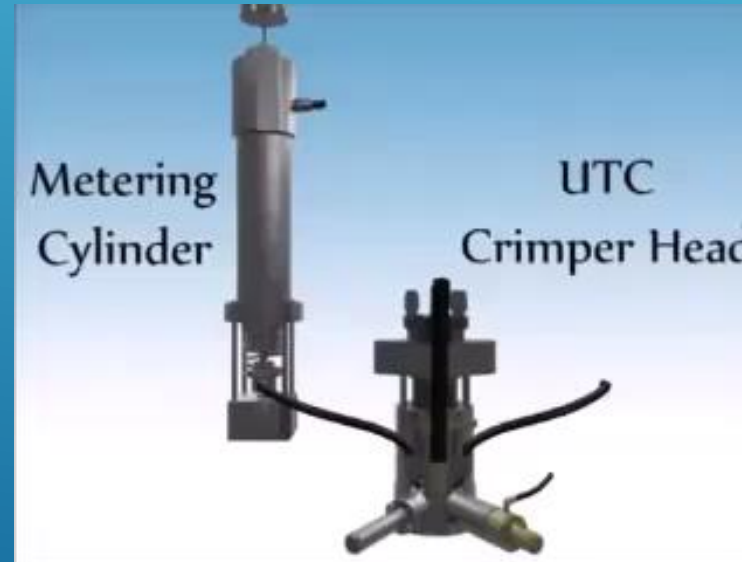
- 3-5cc of gas loss left between the can and the crimp head per cycle, requiring costly reclaim due to EPA regulations



Multi Head Kartridg Pak (KP) High Speed Rotary UTC Gasser / Crimper



Single Head (KP) UTC Gasser / Crimper



NITROUS OXIDE & CO2 GASSING

Nitrous oxide and carbon dioxide are used as propellants to deliver food products (for example, whipped cream and cooking spray). Some industrial products like brake cleaner and penetrating oils also use CO₂

Method 1:

- Gas is mixed with the product in saturation towers until blended properly. The product and CO₂ are filled into the aerosol container as one.

Method 2:

- Gas is injected through the aerosol valve stem using time over High pressure. Sometimes the CO₂ is heated to aid in saturation. Shaking is common during gassing

Method 3:

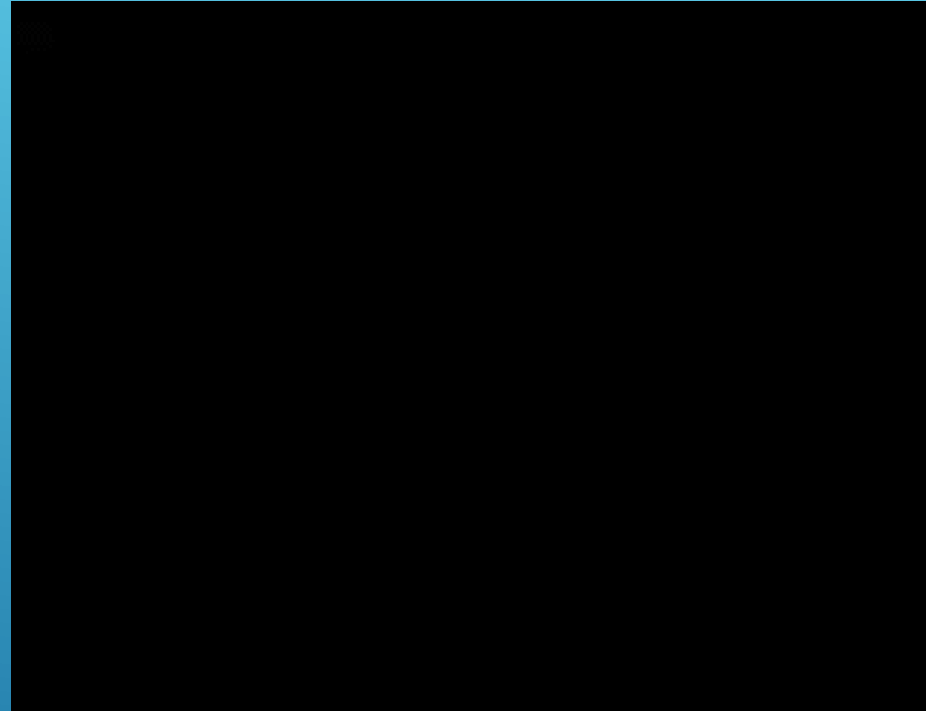
- CO₂ is injected under the aerosol valve cup using time over pressure. Restricted valve lift helps to create turbulence for saturation

Pros:

- Non Flammable
- Does not always require shaking

Cons:

- Will not work with all products
- Can orientation is critical to ensure gas does not empty before product is empty



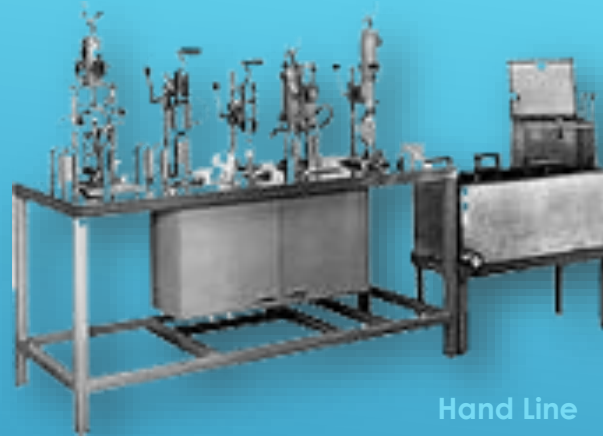
Semi-Automatic
Gasser shaker

EARLY AEROSOL FILLING MACHINERY



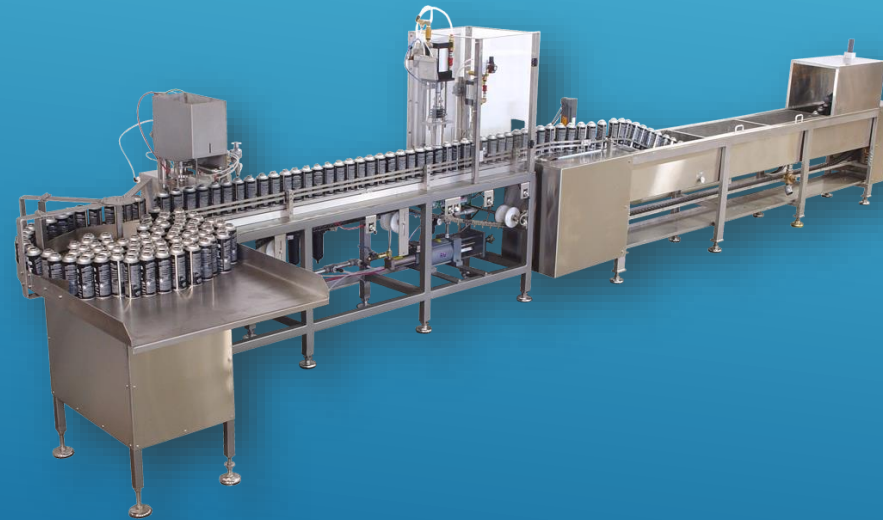
Rotary Index

Product Fill / Crimp / T.T.V. Gas



Hand Line

Product Fill / Crimp / T.T.V. Gas / Hand Bath



Automated Indexing Line

Product Fill / Crimp / T.T.V. Gas / Water Bath

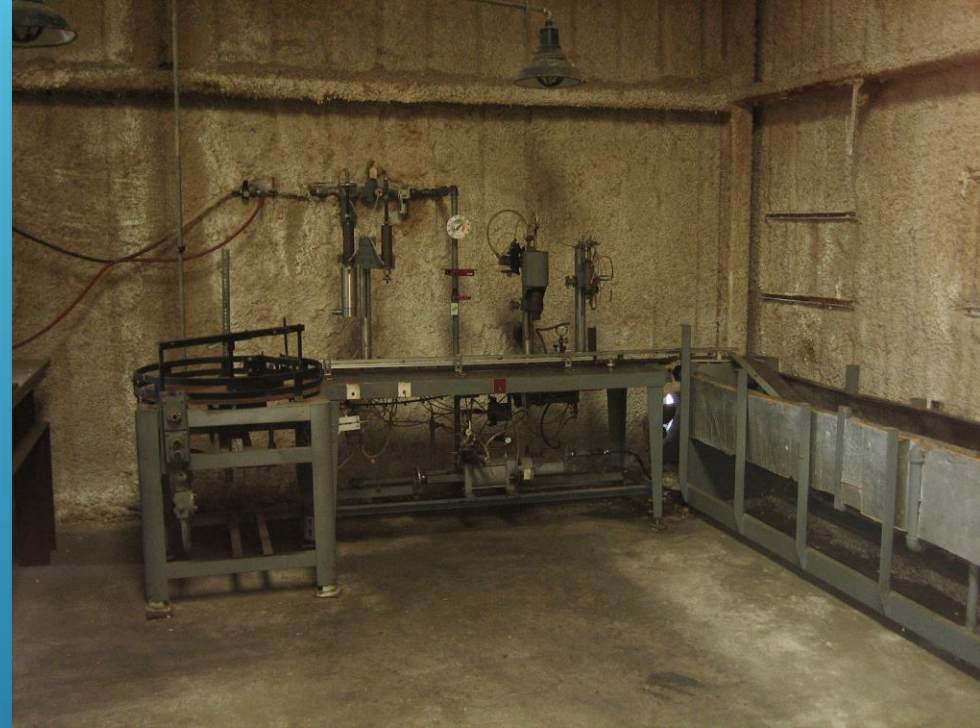
JG MACHINE

First Machines 1950's



Hand Line

Product Fill / Crimp / T.T.V. Gas



Automated Inline Indexing Line

Product Fill / Crimp / T.T.V. Gas / Water Bath

KARTRIDG PAK / BWI KP AEROFILL

First machines 1950's

Known as JA Jones Today



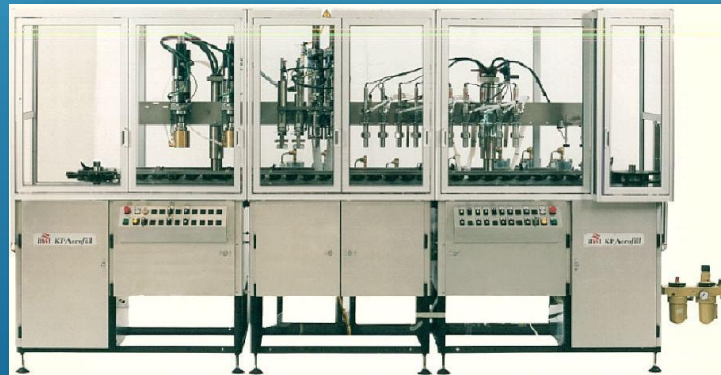
Continuous Motion Rotary
Electromatic Product Filler



CMR Under the Cup Crimper



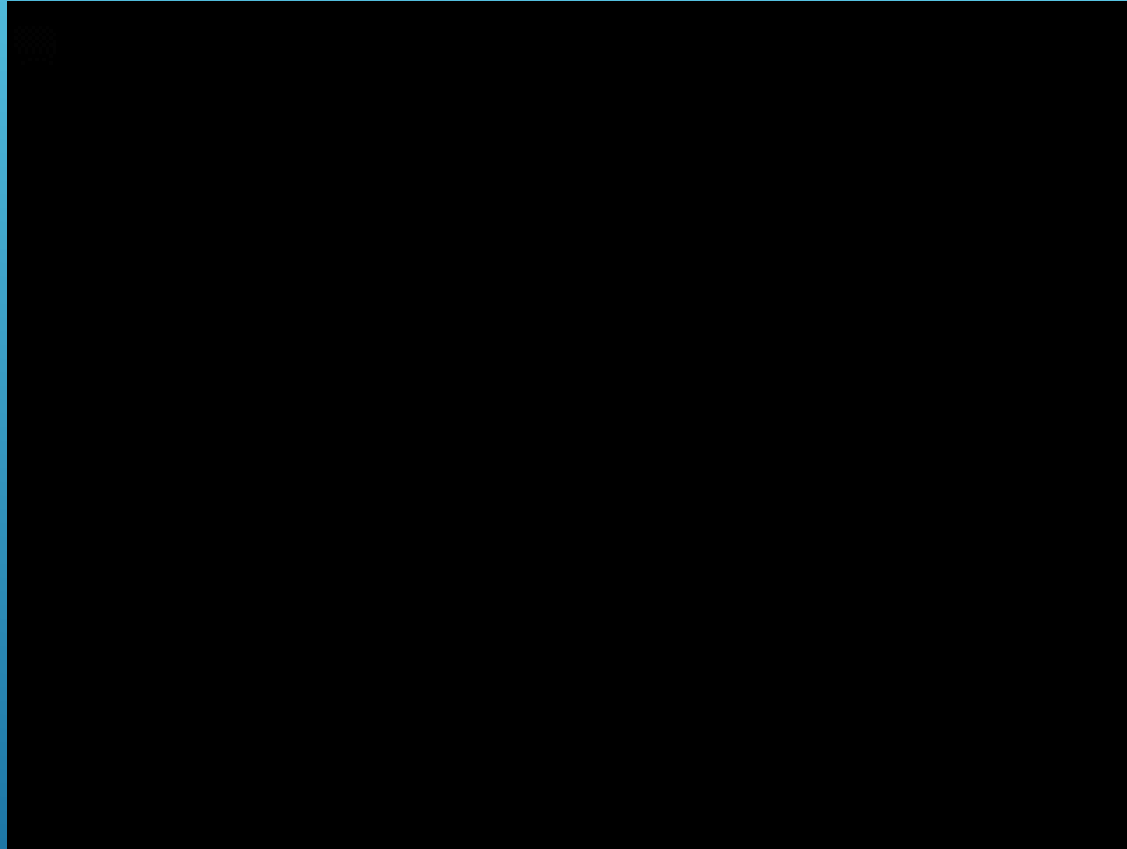
Inline Valve Inserter



Inline Indexing

Product Fill / Valve Insert / crimp

THE BIRTH OF A SPRAY CAN



LAB & SEMI-AUTOMATIC AEROSOL MACHINERY

AEROSOL MANUAL CRIMPING & GASSING LAB MACHINERY



Manual External Bottle Crimp



Manual Internal 1" Crimp



Manual Burette TTV Gasser



SEMI-AUTOMATIC AEROSOL & BAG ON VALVE LAB MACHINERY



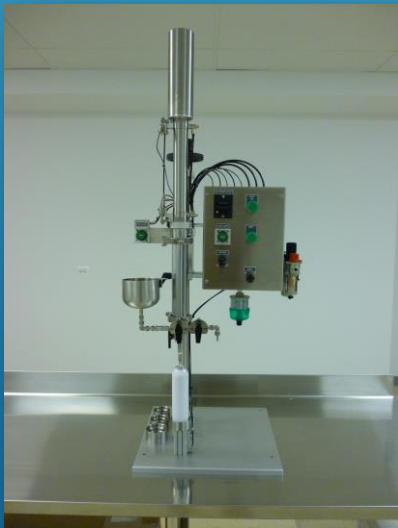
Benchtop Pneumatic Crimping / UTC



Benchtop Pneumatic TTV Gassing
in vented Hood



Combination
Crimper / TTV Gasser



Benchtop ISO Shave Gel Mixer / Filler



BOV UTC Gassing Station

Hendline

SEMI-AUTO LOW PRODUCTION

SEMI-AUTOMATIC LOW PRODUCTION AEROSOL MACHINERY



Product Fill – Crimp – TTV Gas

Cans are moved by hand from station to station

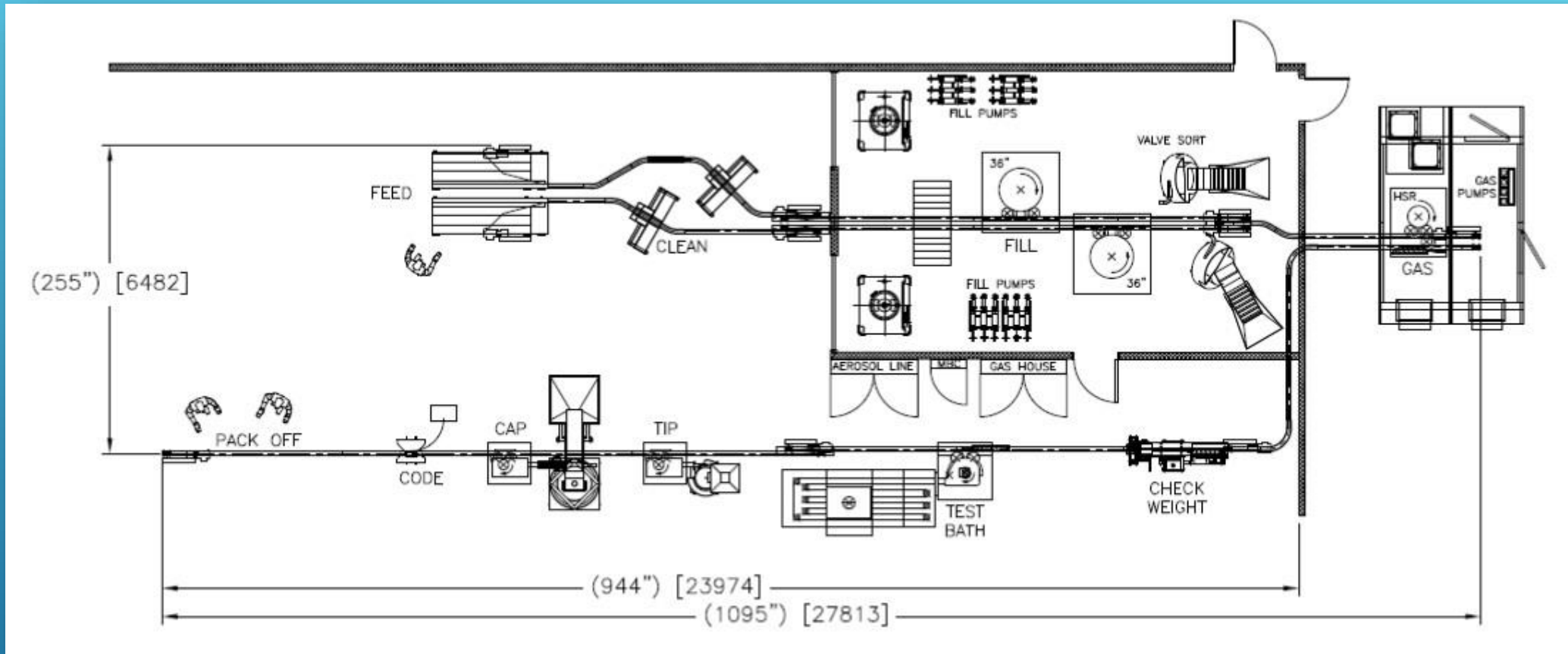


Hot Water Bath Testing

Cans are loaded into baskets and placed into the water by hand

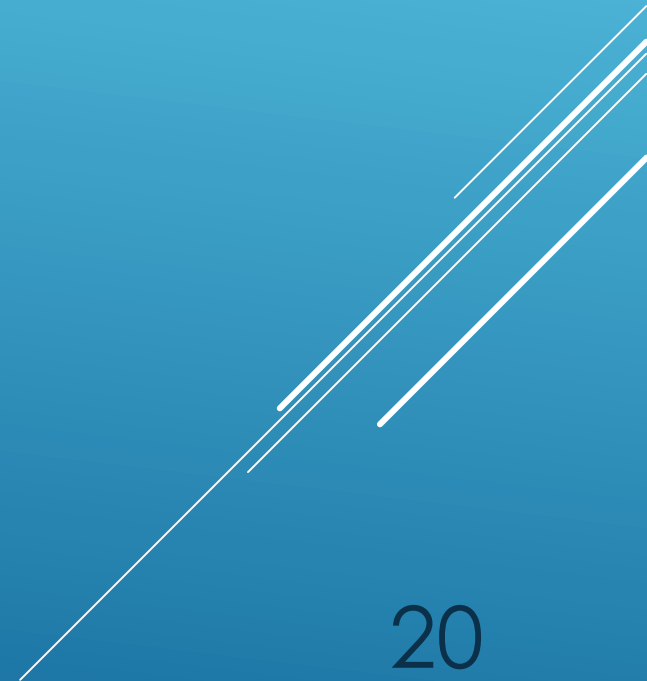
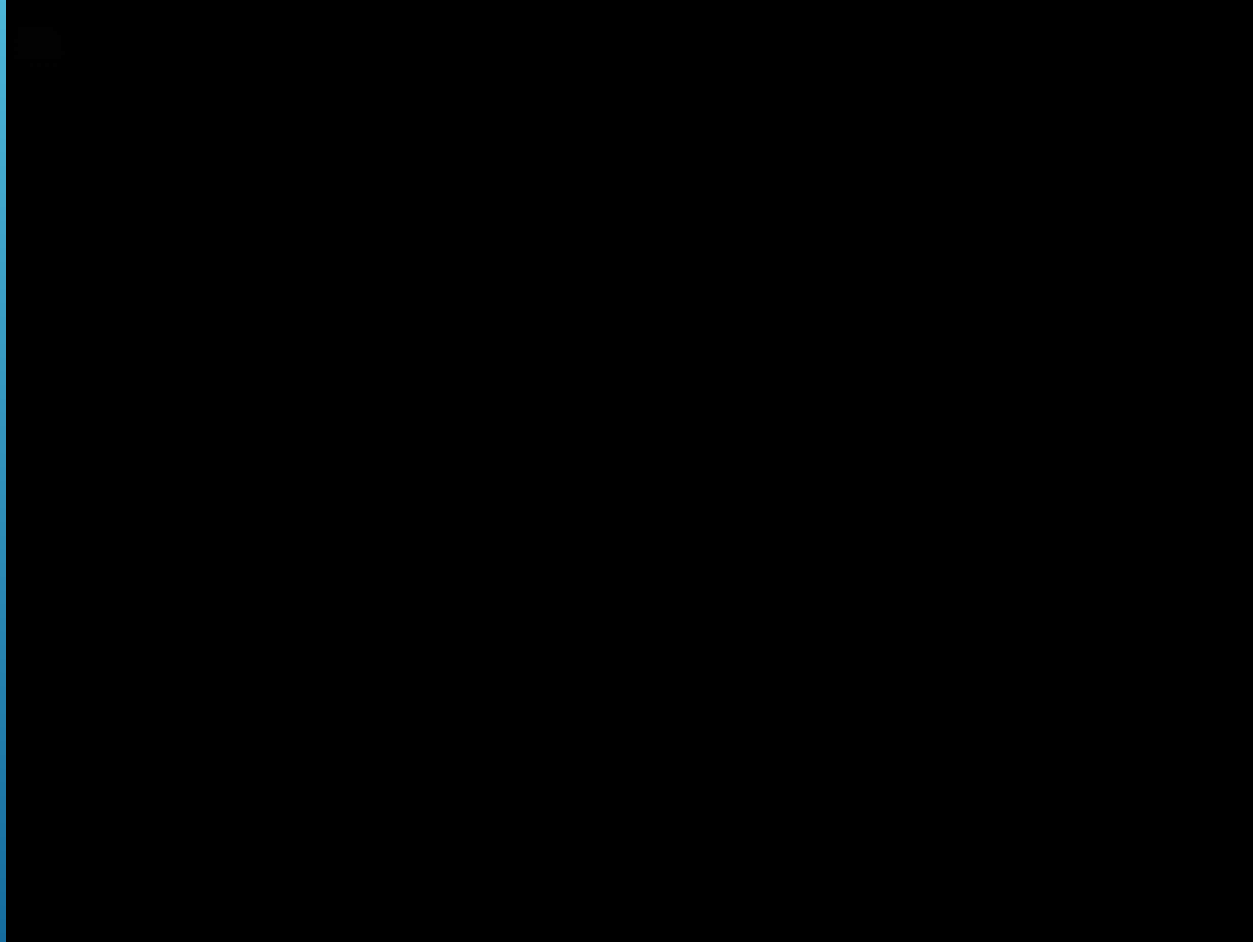
MODERN AUTOMATED AEROSOL FILLING LINES

MODERN AEROSOL LINES 120 CPM

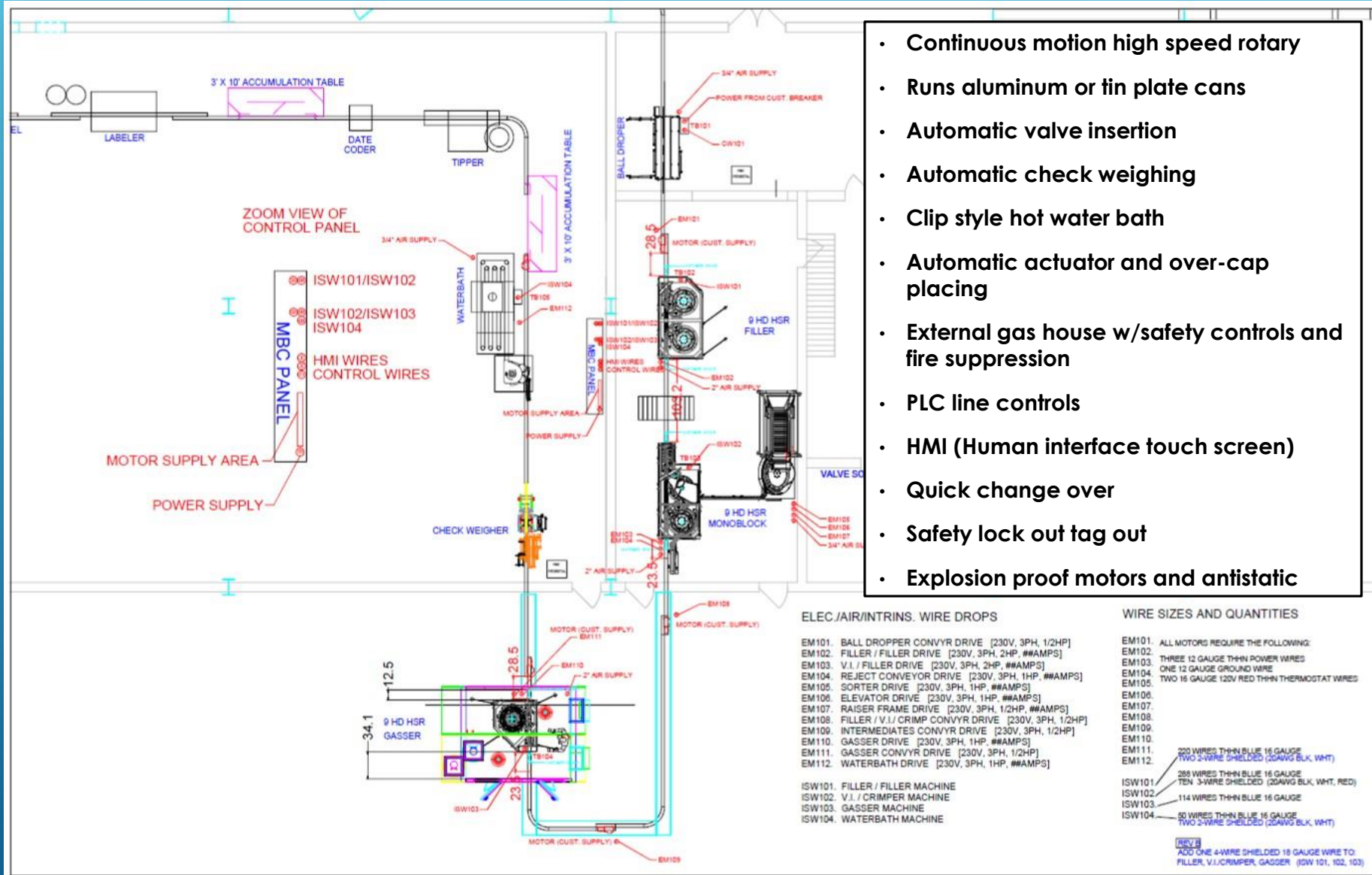


- Runs aluminum or tin plate cans
- Automatic valve insertion
- Automatic check weighing
- Clip style hot water bath
- Automatic actuator and over-cap placing
- External gas house w/safety controls and fire suppression
- PLC line controls w/HMI (Human Interface touch Screen)
- Quick change over
- Safety lock out tag out
- Explosion proof and anti-static

MODERN ROTARY INDEX AEROSOL LINE

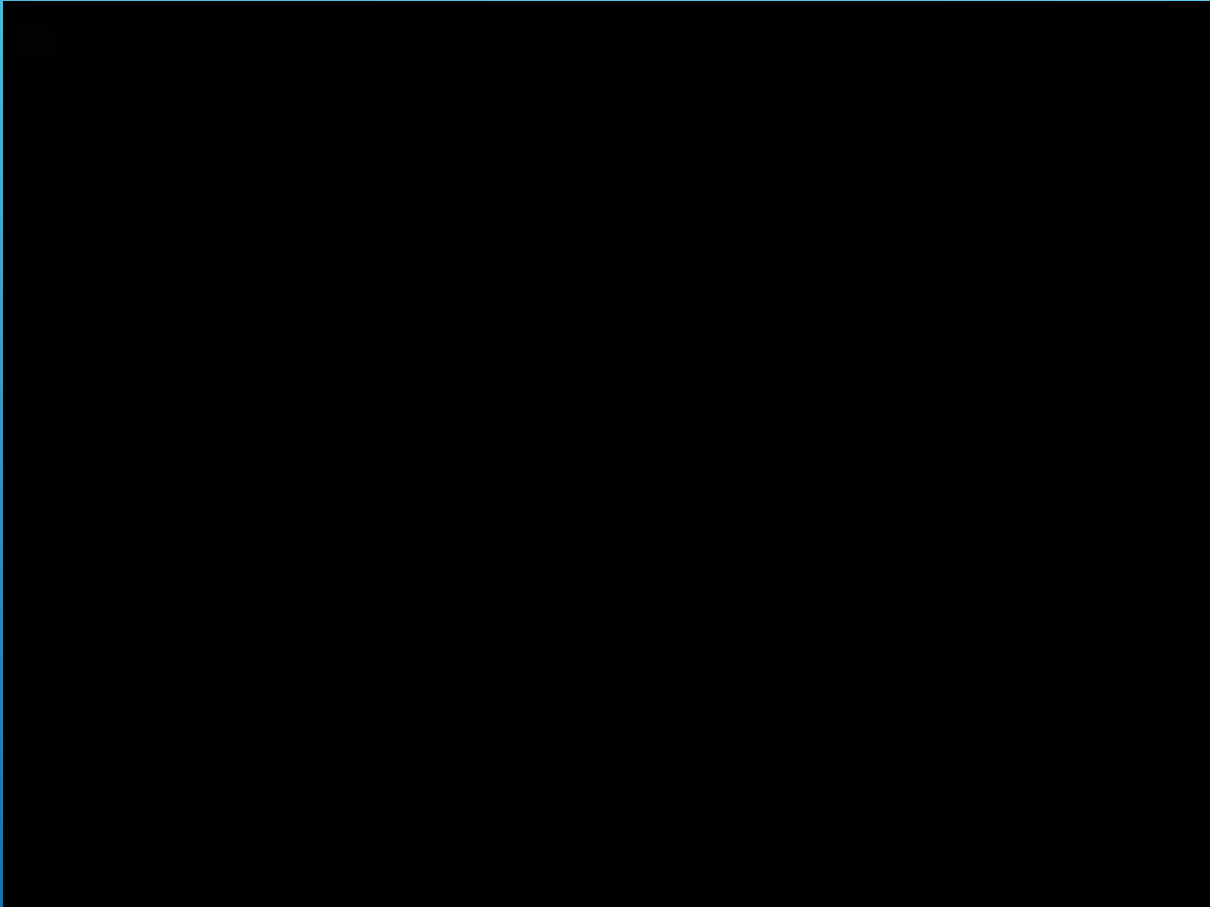


MODERN AEROSOL LINES 300+ CPM



- Continuous motion high speed rotary
- Runs aluminum or tin plate cans
- Automatic valve insertion
- Automatic check weighing
- Clip style hot water bath
- Automatic actuator and over-cap placing
- External gas house w/safety controls and fire suppression
- PLC line controls
- HMI (Human interface touch screen)
- Quick change over
- Safety lock out tag out
- Explosion proof motors and antistatic

MODERN CONTINUOUS MOTION AEROSOL PUCK LINE



MODERN AEROSOL FILLING MACHINERY



Continuous Motion Rotary Mono-block
Product Fill / V.I. / Crimp



Continuous Motion Rotary
Product Filler



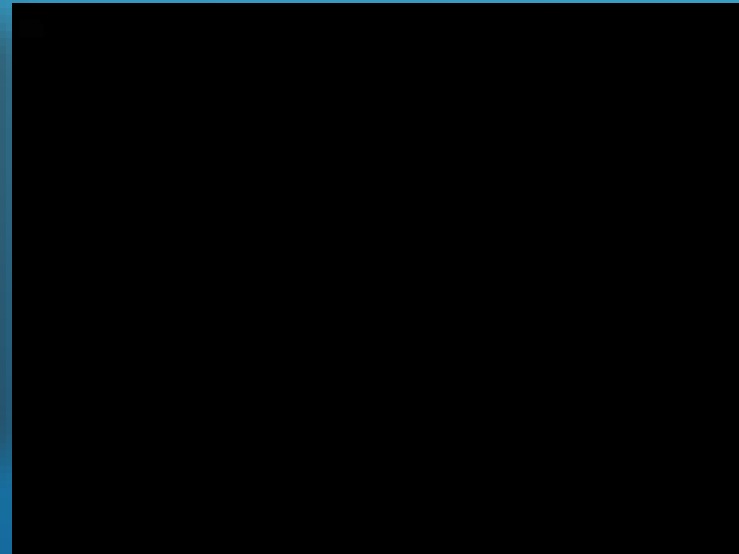
Quad Indexing Inline



Continuous Motion Rotary
T.T.V. Gasser



Valve Insertion



Aluminum / Tin Plate
Valve Sorting

MODERN ANCILLARY EQUIPMENT



Actuator Placer



Cap Placer



Puck Inserter

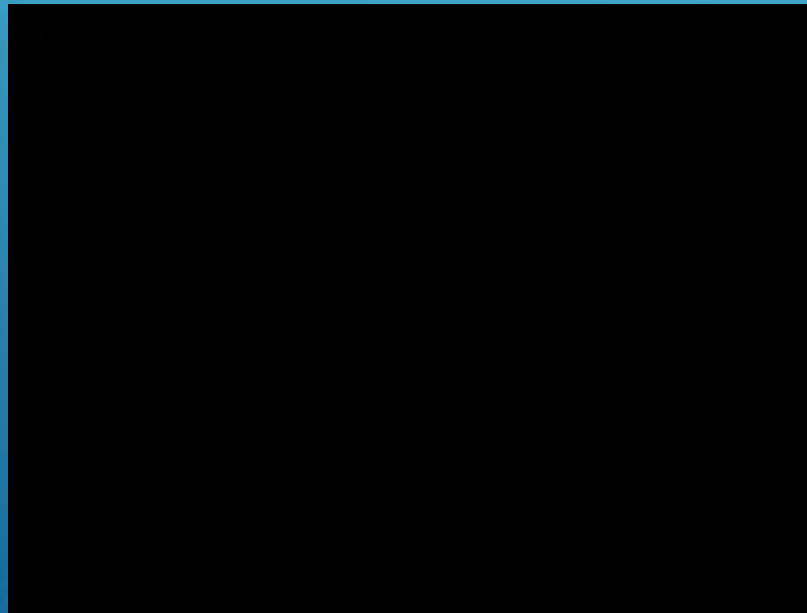


De-Pucker

De-Pucker



Tube Taper



MODERN LEAK TESTING



Clip Style Submersion Testing



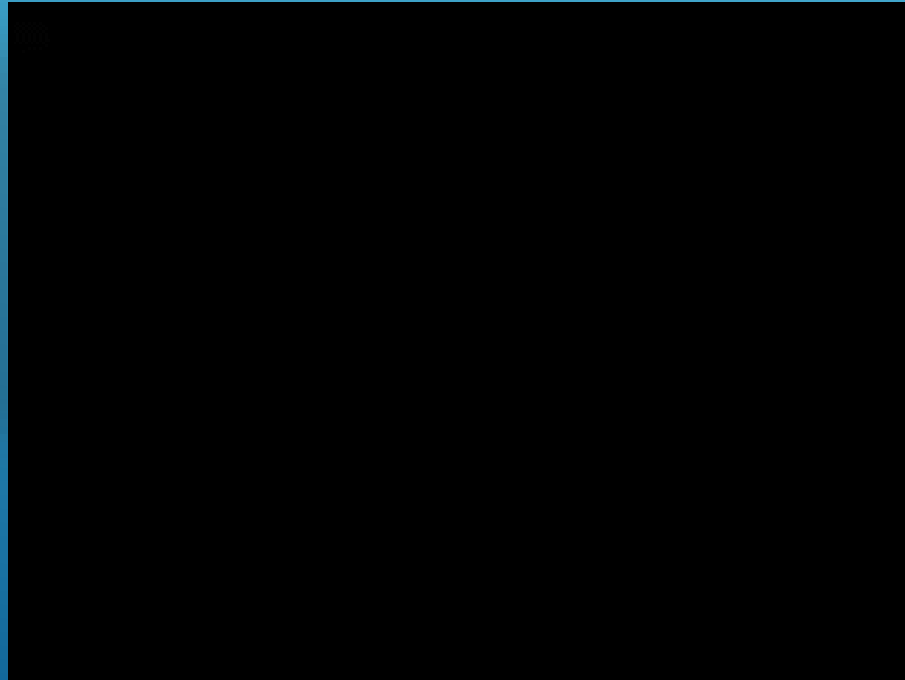
Drum Style Submersion Testing



Inline Contact Pressure Testing

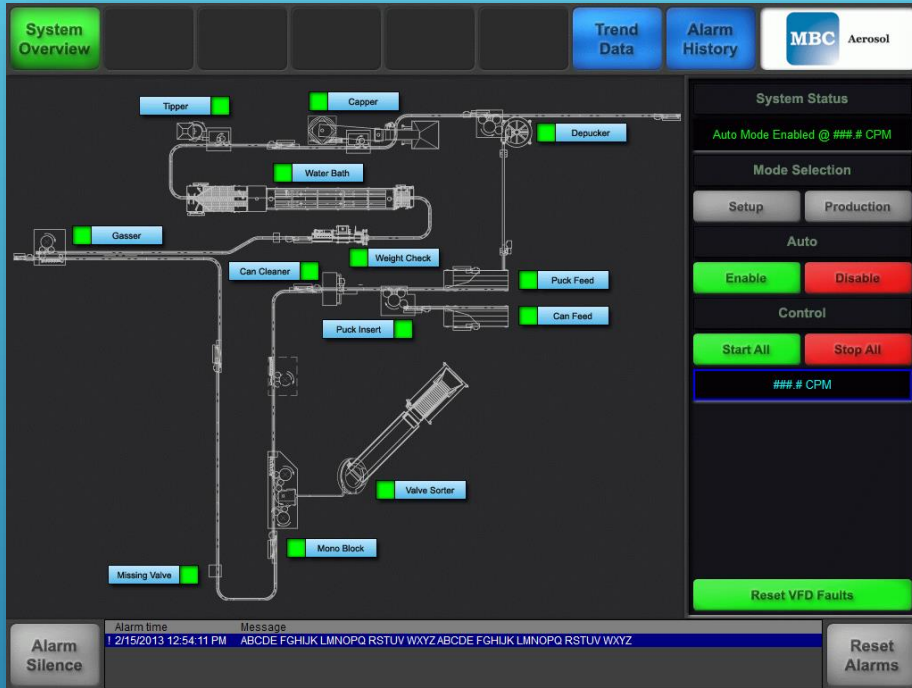


Gas Vapor Trail Testing

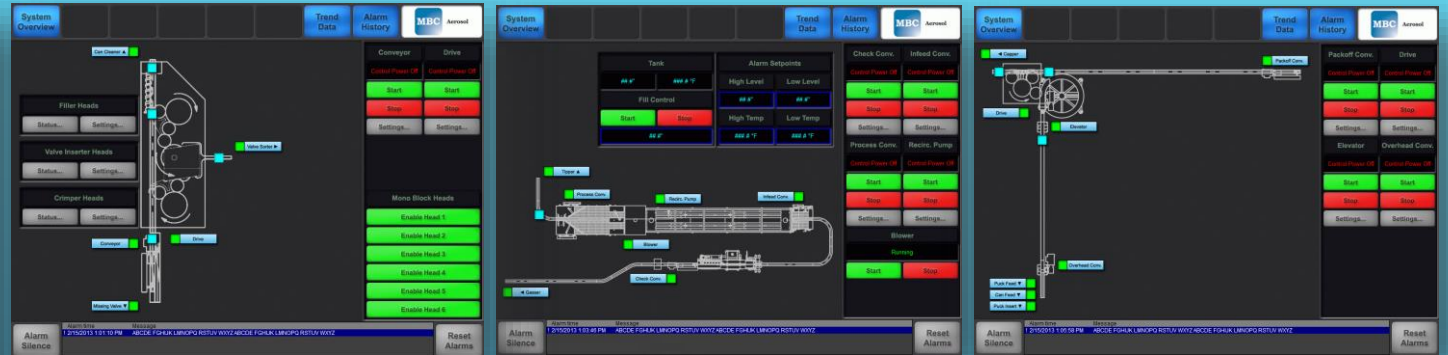


Rotary Vacuum Leak Testing

MODERN PLC CONTROL AEROSOL LINES



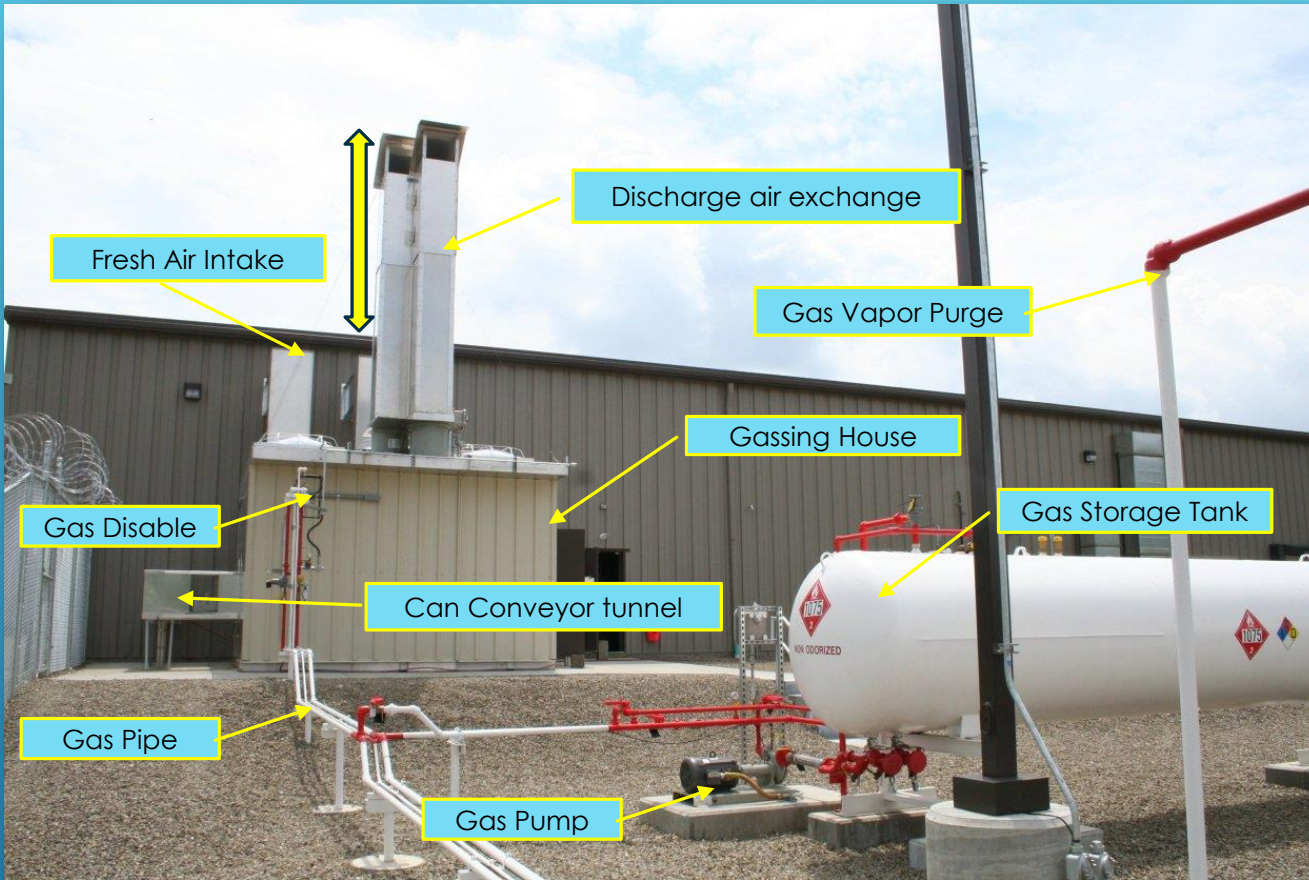
HMI (human interface)



Main electrical panel

- The Aerosol line is completely controlled by a PLC
- Line speed changes with a press of one button
- Remote internet VPN support is available
- Quality control data retrieval is available if required
- Simplifies product change over
- Simplifies trouble shooting
- Interacts with other factory systems like the gas house and water bath heating system

MODERN UNMANNED GAS HOUSE AND TANK FARM



Auto Vent Panel



5ft Between Buildings



Spark, Vapor Detection and fire Suppression

- Follows NFPA30B regulations for flammable gasses
- A Class 1, Div 1 rated area requires explosion proof and intrinsically safe electrical
- Antistatic materials and proper grounding is essential



Gassing Machine in Gas House



BAG ON VALVE / CONTINUOUS SPRAY

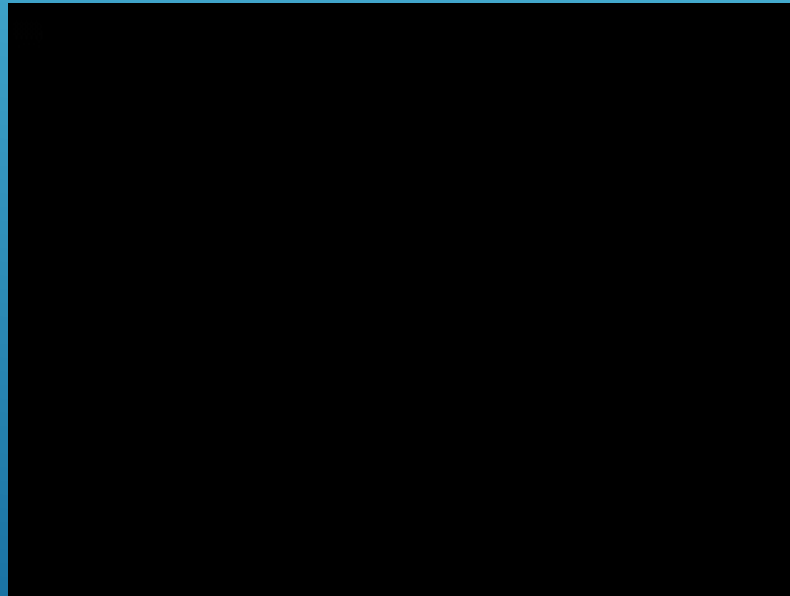
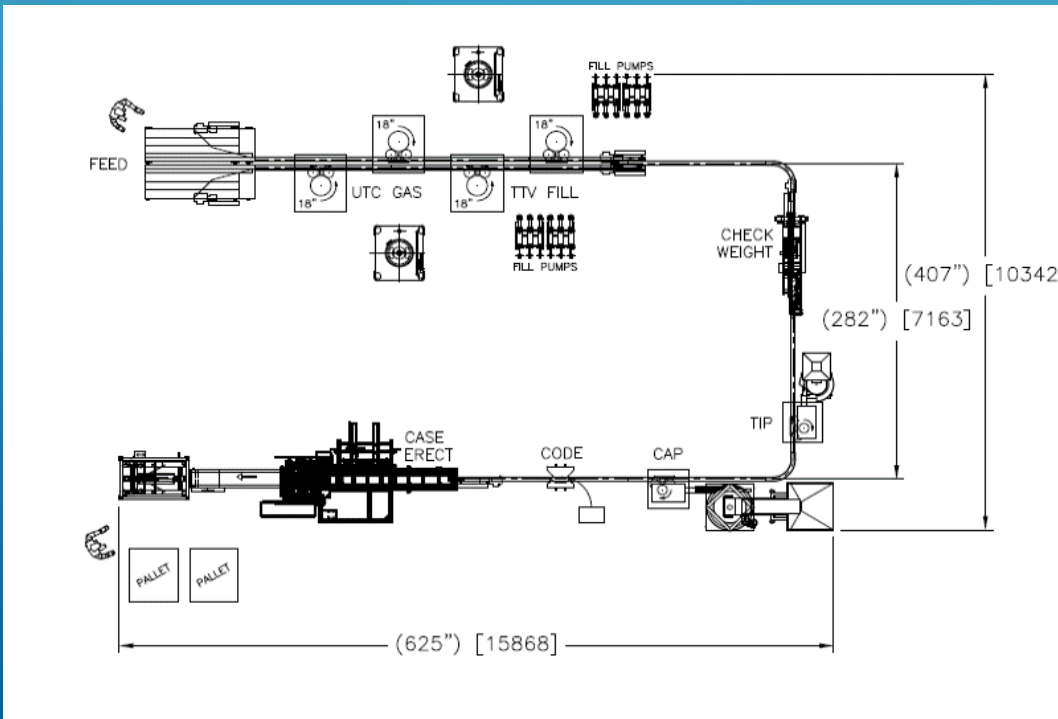


Bag On Valve



Rubber Bladder

- The First BOV was used in the 1980's
- Uses compressed air not liquid gas (rubber bladder is self propelled)
- Existing aerosol lines can be converted but usually a separate production line is better suited
- Line Layouts are shorter
- Pressure testing replaces the hot water bath with DOT exemption



PISTON CANS



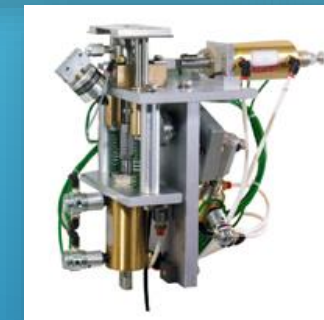
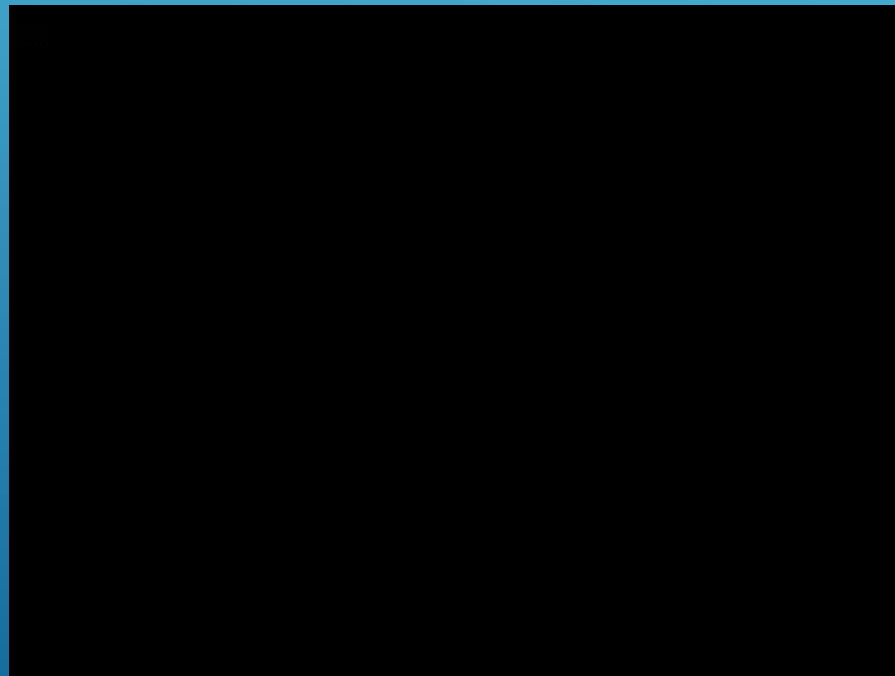
Can in Can



Piston can



- Uses compressed air or hydrocarbon as propellant
- Existing aerosol lines can be converted but usually a separate production line is better suited
- Uses a pre-inserted rubber grommet in the can prior to gassing or the grommet is inserted after gassing



Gasser Plugger

A LOOK INTO FUTURE PACKAGING REQUIREMENTS



External Crimp

Plastic Aerosols



Internal Crimp



Challenges for existing Aerosol lines

- Exotic unstable shapes may require pucks or conveyors that support the bottle from the neck or shape
- Special bottle neck supports may be required for crimping and gassing
- External Crimper heads required
- Clip-style water baths may be required
- Bottles might be manufactured on site and feed directly into the aerosol line

THANK YOU FOR YOUR TIME

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President / Sales

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