PRESENTATION ON

INTRODUCTION TO AN

ELECTRONIC CYLINDER FILLING SYSTEM

Presented By
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LAYOUT OF OLD FILLING PLANT

Unloading point & Chain conveyor → Cylinder washing point → Manual Tare value reading point (operator reads the tare value)

Introduction unit → Filling Carousel with Filling Machines → Ejection unit → Online Check Scale

Sort out conveyor & Under fill check scale with filling gun → Leak Detector system Including CVT & Water dip → Evacuation System (Leaky Cyl evacuated)

SEALING & CAPPING

OK CYL → O/F CYL ADJUSTED

O/F & LEAKY CYL → OK CYL

U/F, O/F & OK CYL
Why an Electronic cylinder Filling System?

• Stringent Filling Accuracy standards
• Data & Information Management
• Reduced Manpower
• Saving in Gas
• Future Expansions
• Safety
• Customer satisfaction & reduced cost
Different units in an electronic cylinder filling system

Equipments in hazardous area

• Chain Conveyor.
• Central Encoding Station with pre check scale.
• Introduction & Ejection units.
• Filling carousel & Filling machine.
• Check Scale.
• Weight correction machine
• Sort-out Conveyors
• Leak detectors
• Power & Data interface
Equipment in Non-hazardous area

- PC including software & database for filling data
- Modem for data transfer.
- Printer for reports.
Controllers & instruments

- Distributed HMI controllers - with 32 I/P & 16 O/P channels.
- Photocell based sensors & switches.
- Pressure switches & Pressure transmitters.
- Pneumatic stoppers, cylinders, pistons & pushers.
- Gun engaging & disengaging switches with auto cut off valves.
- Load cell based weight controllers.
- Solenoid valves.
- Air filter regulators & lubricators.
- IMS PC along with associated Hardware & software.
- Data cabling & Ethernet hub.
- Gas detection system.
Role of Control & instrumentation system in an EFP

• To ensure control of safe passage of cylinders from unloading point to loading point with dedicated controllers & field instrumentation system

• Tare weight encoding station with controls

• Interlocking of introduction/ejection unit for:
  – Anti jamming output.
  – Introduction only when platform empty.
  – Ejection only when cylinder filled & gun released.
  – Ejection only when the filled cylinder’s conveyor is not in jammed condition
CONT'D.

• Automatic filling of cylinders & gun release with auto cutoff of LPG supply in filling machines
• Automatic Weight checking & sorting of incorrect cylinders
• Weight correction unit with controls.
• GD & PT based leak detection of cylinder valves & 'O' rings with auto sorting of incorrect cylinders
• Automatic sealing & capping of cylinders
BENEFITS OF AN ELECTRONIC CYLINDER FILLING SYSTEM

• Higher accuracy in filling LPG in cylinders
• Automatic introduction/ejection unit to minimize handling
• Fully automatic Weight Check Scale Checks over 1200 cylinders/hr and sorts non-conforming cylinders to separate conveyor and Data collection software compatible and Flexible for all cylinder diameters and heights
• Valve Leak Detector Detects to 2 grams/hr (0.004 lb/hr) with Proven infra-red detection principal and Sorts non-conforming cylinders to separate conveyor
CONTD.

- Reduced manpower, Increased safety, Improved consistency and Increased plant throughput
- Less down time and maintenance
- Optimal PC data collection tool for effective filling and maintenance
- Rapid encoding or automatic reading of cylinder tare
- Filling machines and filling heads adapted to cylinders and cylinder valves
- Easy calibration and zero-setting
- Check weighing system in-line with chain conveyor for fully automatic check weighing with automatic transfer of tare weight from central encoding station
Fig. 4 – The better filling accuracy obtained by an electronic filling machine compared to a mechanical unit means that the average filling value for electronic filling is much closer to the minimum filling limit value without underfilling the gas cylinders.

- C = Number of cylinders
- E = Filling on electronic equipment
- M = Filling on mechanical equipment
- W = Weight
- W1 = Minimum permitted filling limit
- W2 = Maximum permitted filling limit
- \( \Delta W \) = Difference between the average filling value for all electronically filled cylinders and the average filling value for all cylinders filled on mechanical equipment
- O = Overfilled cylinders
Electronic Carrousel Filling System

- An **electronic carrousel** filling system is designed for safe and effective filling of all kinds of LPG cylinders.
- The most effective way of filling LPG cylinders
- High capacity filling, up to 1,800 cylinders per hour
- Fully automatic cylinder flow.
- High safety level due to intrinsically safe network.
- Decentralized control units independent of PC’s
- Rapid encoding or automatic reading of cylinder tare
- Control system uptime: 99%
- Total overview of the filling production is possible due to PC data collection
Carrousel filling system with UFM universal filling machines
1 UFM universal filling machines mounted on filling carrousel
2 UFM universal filling machine with three filling heads for fully automatic filling of domestic cylinders with three different types of centre valves
3 Adjustable HM/IUC controller – easy to use and program
4 UFM universal filling machine with mass flow meter
Electronic Filling Machine

- Electronic filling machine is designed for safe and accurate filling of all types of LPG cylinders and valves.
- Most used filling machine in the world
- Weighing principle (load cell) or mass flow principle.
- Operation: fully automatic, semi-automatic.
- Installation: on carrousel, in-line in conveyor, or as stand-alone unit
- Flexible to different cylinder diameters, heights and cylinder valves
- Modular design.
Check Weighing Systems

- Electronic check weighing systems are designed for accurate and quick control of the net content in LPG cylinders. The systems ensure correctly filled cylinders.
  - Principle: Load cell based with digital display.
  - Controller: HMI distributed controller.
  - Safe cylinders to end-users
  - Automatic sort-out of under- and overfilled cylinders
  - Capacity up to 1,800 cylinders per hour
  - Flexible for all cylinder diameters and heights
  - Easy installation in existing plants
Electronic check scale
Electronic Leak Detectors and Valve Testers

- Electronic leak detectors and valve testers perform tests on LPG cylinder valves. The cylinders are approved or rejected according to preset permitted values.
- Principle: Infrared GD & Pressure transmitter based.
- Control: HMI based distributed controller.
- Provide maximum safety
- Fully automatic test with same sorting limit
- Eliminate human errors
- Detect all kinds of leak around the valve
- Check the valve form (centre valves only)
- Flexible for all types of valves
- Flexible for all cylinder diameters and heights
- Easy installation in existing plants
- Minimum space requirements
Production Data Management System

• Production Data Management System in an electronic filling plant collects data from filling process machines controlled by the HMI/CUC controller. The data is monitored and serves as a basis for reports concerning the filling process.
• Automatic collection of all important production data
• High safety level due to production surveillance
• Effective tools for viewing and analyzing production data
• PC monitoring of real time production status
• Report statistics for filling hall production overview
• Easy identification of maintenance and adjustments needs
• Ready for direct connection to existing CUC network.
Example of CUC configuration

1. PC system (hardware and software)
2. Ex-proof CPI-Ex power supply
3. HMI/CUC controller for pallet plant
4. Slip ring
5. Carrousel filling system
6. HMI/CUC controller for UFM filling machine installed on filling carrousel
7. HMI/CUC controller for introduction at filling carrousel
8. HMI/CUC controller for ejection at filling carrousel and for ECS check scale
9. HMI/CUC controller for leak detector
10. HMI/CUC controller for stationary

a. Load cell module
b. Load cell
c. T-connector
d. Connection box
S. Non-hazardous area
X. Hazardous area
Graphic display of total filling capacity and filling accuracy

CUC Monitor - 12 kg cylinder

Current capacity [cylinders/h]

- 974

Normal distribution curve

Select Filling Machine: All

Total No. for view: 3765

Reset

Filling machines

0 250 500 750 1000

100% 75% 50% 25% 0%

-400 -300 -200 -100 0 100 200 300 400

1/27/2004 09:18:25 System Ready / Program Started
### Total Counters (for this session)

<table>
<thead>
<tr>
<th>Counter Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total processed cylinders for Filling Machines</td>
<td>73</td>
</tr>
<tr>
<td>Total processed cylinders for Leak GD</td>
<td>71</td>
</tr>
<tr>
<td>Total processed cylinders for Leak PT</td>
<td>71</td>
</tr>
<tr>
<td>Total processed cylinders for Adjustment scale</td>
<td>71</td>
</tr>
<tr>
<td>Total number of alarm events</td>
<td>0</td>
</tr>
<tr>
<td>Total number of database records</td>
<td>73</td>
</tr>
</tbody>
</table>

### Total LPG (for this session)

<table>
<thead>
<tr>
<th>LPG Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total LPG flow</td>
<td>2359.4 kg</td>
</tr>
<tr>
<td>Total residual LPG</td>
<td>299.3 kg</td>
</tr>
</tbody>
</table>
THANK YOU