Dear esteemed members and student members,

It gives me a great pleasure to welcome you all to this edition of Inteq Magazine. This is the 3rd issue for this year and I am sure that all of you are enjoying this professional magazine. As you all must have realized that ISA offers a professional platform for networking and professional growth.

As you all may be aware that we have scheduled our Annual general Body Meeting (AGM) on 22nd July 2012 at Navi Mumbai Sports Association. The notice for the same is already issued and I request all of you to actively participate and take our section to greater heights. It is an opportunity for all members to be part of the Executive Committee and enhance leadership capabilities. We have conducted a seminar on Hazardous Area Classification on 14th July 2012 at Pidilite conference hall in Mumbai which was a great success.

We once again request all to actively participate and make our section vibrant.

We trust this issue will give you valuable information. Your feedback and your contribution in terms of technical articles and e-advertisements will be highly appreciated.

Thanking You All

V.P. Raman
President
ISA Maharashtra section
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EDITOR’S NOTE

It gives us great pleasure to release the July edition of this magazine. The theme used is the “Moon Landing”. Stepping down on the Moon on 20th July 1969, Armstrong described the event: “One small step for a man, one giant leap for mankind” which was heard by people worldwide as the landing was broadcasted on live TV.

We request all members and student members to contribute technical articles. We also request institutions and vendors to contribute e-advertisements. Together we can make this journal reach newer heights.

You are also invited to connect with ISA Maharashtra on Linkedin at following address:

http://www.linkedin.com/groups/ISA-MAHARASHTRA-SECTION-3816825

We are now also on Facebook. Connect with us on:

International society of automation Maharashtra section

Editor               Asst. Editor
H.S.Gambhir             Samik Basu
### ISA Maharashtra Section Membership Status

(As per 20.06.2012)

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- *New membership requests under processing.
- Some Regular & Student Members’ registration under process at the HQ.
Highlights

1. The EC Members felt that we need to have a dedicated Maharashtra Section Website, where all events/programs could be published apart from our INTEQ magazine and other technical articles, which could be uploaded. Till we get our own Site, the same will be hosted by our EC member Mr. H S Gambhir. Details will be circulated separately.

2. ISA Maharashtra Section had two interactive meetings on 21st January 2012 and 17th March 2012 with Faculty Members (Instrument Dept.) of around 9 colleges to try and understand their concern on Syllabus, Industry Visits, Project allocation and guidance and Campus Placement. This meet was attended by Executive Committee Members – Mr. Venkatram, Mr. Bharat Kaul, Mr. Vithal Magar, Mr. Agnihotri and Mr. Sagar Sawant. This was an important meeting and based on the outcome, some suggestions were shared with the faculty members for cascading to their students.

3. A Seminar on “hazardous area” was arranged on 14th July 2012 within the Pidilite Industry premises. It was a grand success. Details and pictures will be printed in next issue.
International Society of Automation
Educational Foundation 2012 Scholarship

ISA Educational Foundation Scholarships are awarded to college or university students who demonstrate outstanding potential for long-range contribution to the fields of automation and control. The scholarship awards support tuition and related expenses and research activities and initiatives.

Please visit the ISA website for more details. The scholarship application form is available on the website.

The ISA Student Sections are requested to make this information available to the Student Members so that they can take advantage of this benefit.

Please note that during 2011 two Indian Students had won these scholarships.
We are pleased to announce that our senior member Shri A. Ramanathan has been awarded the "Celebrating Excellence Award for Excellence in Enduring Service" by ISA Executive Committee, USA. We congratulate him on this achievement and we are so proud of him.

**PROFILE:**

Shri. A. Ramanathan has graduated in Instrumentation Technology from Madras Institute of Technology, Chennai in 1969 & has got 43 years of Industrial experience with varied exposure on all aspects of Process Chemical Industries not only in Instrumentation but also in executing mega Petrochemical, Petroleum & Infocomm projects. He is presently working as Sr. Exe. Vice President in Reliance Group & his present engagement is focused on development of HSE team in EPC Projects set-up. He plays an important role in mentoring the next generation Professionals. He has been associated with the implementation of world’s largest Petroleum Refinery at Jamnagar.

He has got long & diverse professional experience with all round exposure to the various facets of Petroleum & Petrochemical industry in diverse functions of Engineering, Project Management, Construction & commissioning, Operations & Maintenance. During his career he has been instrumental in creating the largest urban spatial database in India as part of Reliance Telecom GIS solution and this has been acknowledged at national & international level by awarding him “Special Achievement in GIS” award in 2003 at International Users Conference at San Diego.

Shri. A. Ramanathan, as part of his professional advancement became a member of ISA in 1972 & he is the senior most living member currently. He has been the District Vice President of ISA (2005-2008) for Asia Pacific District. To his credit he has been one of the first to introduce DCS system for a large Refinery at Vishakhapatnam in 1983. Recognizing his potential the Industry Ministry has utilized his services as Member Secretary for the Govt. constituted committee to review and incorporate rule amendments for the existing statutory codes under Petroleum Storage and SMPV Act (Static & Mobile Pressure Vessels).

His present employment with Reliance has given him large opportunities not only to strengthen his technical skills but also created enough avenues to interact / establish contacts with international professional communities.
Dear Mr. Gambhir,

Excellent work and I fully endorse it for circulation. No comments/suggestions. I take this opportunity to thank Mr. Gambhir and Mr. Samik Basu, for coming up with this excellent edition of INTEQ. Congratulations and keep it up.

Regards,
V.P. Raman

Dear Sir,

Thanks for including the article.
The issue has come up nicely. Congratulations to Samik.
The answer to the crossword may be added in the last page.

Regards,
Vikas Singh
IBR - Indian Boiler Regulations

by V.P.Raman
President
ISA Maharashtra section

IBR is Indian Boiler Regulations, which was created on 15th September 1950 in exercise of the powers conferred by section 28 & 29 of the Indian Boilers Act. The Indian Boilers Act was formed in 1923, 23rd February to consolidate and amend the law relating to steam boilers.

**Which steam boilers and steam pipes are regulated by IBR?**

**Steam boiler:**
Steam boilers under IBR means any closed vessel exceeding 22.75 liters in capacity and which is used expressively for generating steam under pressure and includes any mounting or other fitting attached to such vessel which is wholly or partly under pressure when the steam is shut off.

**Steam pipes:**
IBR steam pipe means any pipe through which steam passes from a boiler to a prime mover or other user or both if pressure at which steam passes through such pipes exceeds 3.5 kg/cm² above atmospheric pressure or such pipe exceeds 254 mm in internal diameter and includes in either case any connected fitting of a steam pipe.

**How to register a new Boiler?**

[As per section 7 of Indian Boiler Act, 1923]

1. The owner of any boiler which is not registered under the provisions of this Act may apply to the inspector to have the boiler register. Every such application shall be accompanied by prescribed fee. On receipt of an application under subsection (1), the inspector shall fix a date, within thirty days or such shorter period as may be prescribed from the date of the receipt, for the examination of the boiler and shall give the owner thereof not less than ten day notice of the date so fixed.

2. On the said date the inspector shall proceed to measure and examine the boiler and to determine in the prescribed manner the maximum pressure at which such boiler may be used, and shall report the result of the examination to the Chief Inspector in the prescribed form.

3. The Chief Inspector, on receipt of the report, may - Register the boiler and assign a register number thereto either forthwith or after satisfying himself that any structural alteration, addition or renewal which he may deem necessary has been made in or to the boiler or any steam-pipe attached, or Refuse to register the boiler - Provided that where the Chief Inspector refuses to register a boiler, he shall forthwith communicate his refusal to the owner of the boiler together with the reasons.

4. The Chief Inspector shall, on registering the boiler, order the issue to the owner of a certificate in the prescribed form authorizing the use of the boiler for a period not exceeding twelve months at a pressure not exceeding such maximum pressure as he thinks fit and as is in accordance with the regulations made under this Act.
5. The Inspector shall forthwith convey to the owner of the boiler the orders of the Chief Inspector and shall in accordance therewith issue to the owner any certificate of which the issue has been ordered, and, where the boiler has been registered, the owner shall within the prescribed period cause the register number to be permanently marked thereon in the prescribed manner.

**When and how the renewal of certification of a boiler is done?**

1. A certificate authorizing the use of a boiler shall cease to be in force under the following:
   a) On the expiry of the period for which it was granted.
   b) When any accident occurs to the boiler.
   c) When the boiler is moved (excluding vertical boilers with heating surface less than 200 sq. ft., (portable boilers or vehicular boilers).
   d) When any structural alteration, addition or renewal is made in or to the boiler.
   e) If the Chief Inspector in any particular case so directs when any structural alteration, addition or renewal is made in or to any steam pipe attached to the boiler.
   f) On the communication to the owner of the boiler of an order of the Chief Inspector or Inspector prohibiting its use on the ground that it or any steam pipe attached thereto is in a dangerous condition.

2. When a certificate ceases to be in force the owner of the boiler may apply to the inspector for a renewal thereof for such period not exceeding twelve months as he may specify in the application. [Provided that where the certificate relates to an Economizer or an unfired boiler which forms an integral part of a processing plant in which steam is generated solely by use of oil, asphalt or bitumen as a heating medium, the application for its renewal may be for a period not exceeding twenty-four months].

3. An application under Sub Section (3) shall be accompanied by the prescribe fee and, on receipt thereof, the Inspector shall fix a date, within thirty days or such shorter period as may be prescribed from the date of the receipt, for the examination of the boiler.

4. Provided that, where the certificate has ceased to be in force owing to the making of any structural alteration, addition or renewal, the Chief Inspector may dispense with the payment of any fee.

5. On the said date, the Inspector shall examine the boiler in the prescribed manner and if he is satisfied that the boiler has a steam pipe or steam pipes attached thereto are in good condition shall issue a renewed certificate authorizing the use of the boiler for the specified period at a pressure not exceeding such maximum pressure as he thinks fit and as is in accordance with the regulations made under this Act.
FREQUENTLY ASKED QUESTIONS

Q.1: How to improve poor boiler steam-fuel ratio and increase boiler efficiency?

Answer:
For occasional low efficiency --- clean the burner tips and fuel oil pumps filters, check for viscosity of fuel oil, burner tip holes and atomizing steam pressure. For continuously low efficiency -check flame color & if the color of the flame is not bright golden yellow, combustion is poor. If stack temperature is high, there is soot deposition in the boiler. Stop the boiler and carry out cleaning of the boiler. Check water side deposition/ scale formation. If scale formation is observed, plan for cleaning the boiler with appropriate method. Evaluate for installation of economizer and soot blowing frequency.

Q.2: Soot deposition in my boiler is heavy. How to reduce soot formation and deposition?

Answer:
The reasons for heavy soot deposition are normally due to:

1. Poor quality of fuel with higher ash content metals, high insolubility and hence ensure good quality of fuel.
2. Poor combustion; improve the combustion by checking Atomizing Steam pressure by cleaning burner tip and fuel oil system filters and checking viscosity near burner tip.
3. Avoid mixing of different types of fuels.

Q.3: Blow down losses are heavy, how to reduce blow down rate?

Answer:

1. Monitor boiler water treatment. All volatile treatment is better than conventional treatment if there is techno-economic feasibility.

Q.4: There is corrosion problem in the pressure parts on F.W. circuit, how to overcome the problem?

Answer:

1. Check proper deaeration in the Deaerator. D.O. should be less than 7 PPB.
2. Maintain pH more than 9 in the CBD water.
3. Closely monitor TSP level in the CBD water.
4. Check feasibility of changeover of BFW treatment to AVT.
5. Verify for proper selection of oxygen scavenger if used.

Q.5: In my boiler, Burner tip choking is frequently. How to solve it?

Answer:

To avoid frequent Burner tip choking, check for - poor fuel quality, improper fuel temperature/viscosity at Burner tip, high ash content in the fuel and passing of sludge particles through filter. Check for filter mesh size.

Q.6: Chimney emits blackish smoke frequently, how to ensure proper stack emission?

Answer:

Blackish smoke for chimney indicates poor combustion or inadequate combustion air, take necessary action to improve combustion and adjust fuel-air ratio. If ID and FD dampers are not free, the operation will be sluggish and result in poor combustion during load variation. Rouse the damper.
V – Cone Technology (DP Metering for the New Millennium)

by Sandeep Chawla – 
Sr. Engineer Projects E&P 
(Instrumentation & Controls) 
Reliance Industries Limited

Introduction:
For many years, differential pressure meters were the only devices available, for measuring volumetric flow rate in a pipe with reasonable accuracy. A more recent technology is the V-Cone differential pressure meter, which uses a centrally mounted cone to generate a DP. The purpose of this article is to outline the characteristics of the device, its unique design construction and operation. The first experiments being made by Bernoulli during the 1740’s from which the Bernoulli principle was derived, this lead to the concept of a flow nozzle by Venturi and subsequently the orifice plate, which is used today worldwide.

Principle of Operation:
The V-Cone is a differential pressure type flow meter. The principle theory among these is Bernoulli’s theorem for the conservation of energy in a closed pipe. This states that for a constant flow, the pressure in a pipe is inversely proportional to the square of the velocity in the pipe. Simply, the pressure decreases as velocity increases. For instance, as fluid approaches the V-Cone meter, it will have a pressure of P1. As the fluid velocity increases at the constricted area of the V-Cone, the pressure drops to P2, as shown in Figure 1. Both P1 and P2 are measured at the V-Cone’s taps using a variety of differential pressure transducers. The Dp created by a V-Cone will increase and decrease exponentially with the fluid velocity. As the constriction takes up more of the pipe cross-sectional area, more differential pressure will be created at the same flow rates. The beta ratio equals the flow area at the largest cross section of the cone (converted to an equivalent diameter) divided by meter’s inside diameter.
Reshaping the Velocity Profile:

The V-Cone is similar to other differential pressure (Dp) meters equation of flow that it uses. V-Cone geometry, however, is quite different from traditional Dp meters. The V-Cone constricts the flow by positioning a cone in the center of the pipe. This forces the flow in the center of the pipe to flow around the cone. This geometry presents many advantages over the traditional concentric Dp meter. The velocity would be zero at the wall of the pipe, maximum at the center of the pipe, and zero again at the opposite wall. This is due to friction at the pipe walls that slows the fluid as it passes. Since the cone is suspended in the center of the pipe, it interacts directly with the “high velocity core” of the flow. The! cone forces the high velocity core to mix with the lower velocity flows closer to the pipe walls. Other Dp meters have centrally located openings and do not interact with this high velocity core. This is an important advantage to the V-Cone at lower flow rates. As the flow rate decreases, V-Cone continues to interact with the highest velocity in the pipe. Other Dp meters may lose their Dp signal at flows where the V-Cone can still produce one.

The pipe flow profile in actual installations is rarely ideal. There are many installations where a flow meter exists in flow that is not well developed. Practically any changes to the piping, such as elbows, valves, reductions, expansions, pumps, and tees can disturb well-developed flow. Trying the measure disturbed flow can create substantial errors for other flow meter technologies. The V-Cone overcomes this by reshaping the velocity upstream of the cone.
This is a benefit derived from the cone’s contoured shape and position in the line. As the flow approaches the cone, the flow profile “flattens” toward the shape of a well-developed profile. The V-Cone can flatten the profile under extreme conditions, such as a single elbow or double elbows out-of-plane, positioned closely upstream of the meter. This means that as different flow profiles approach the cone, there will always be a predictable flow profile at the cone. This ensures accurate measurement even in non-ideal conditions.

Beta Ratio (0.45 for large cone to 0.85 for small cone): The ratio of the constricted annulus diameter to the pipe diameter in a differential pressure producing flow meter. For the V-Cone the annulus diameter equivalent is derived from the open area between the pipe wall and the cone edge.

Installation Requirements:
The recommended installation for V-Cone is 0D to 3D of straight run upstream and 0D to 1D downstream. This can be a major benefit to users with larger, more expensive line sizes or users which have small run lengths. V-Cone can be installed adjacent to either single elbows or two elbows out of plane without sacrificing the accuracy.
Signal Stability:
Every Dp meter has a “signal bounce”. This means that even in steady flow, the signal generated by the primary element will fluctuate a certain amount. On a typical orifice plate, the vortices that form just after the plate are long. These long vortices create a high amplitude, low frequency from the orifice plate. This could disturb the Dp readings from the meter. The V-Cone forms short vortices as the flow passes the cone. These short vortices create a low amplitude, high frequency signal. This translates into a signal with high stability from the V-Cone. Representative signals from a V-Cone and from a typical orifice plate are shown above.

Advantages:
1. Low Installed Cost – does not require long straight pipe runs or flow conditioning devices.
3. Superior Performance – Accuracy of +/- 0.5 % of rate and Repeatability of +/- 0.1 %.
4. Measures gas which can be wet, abrasive and has a disturbed flow.
5. Low Total Cost of Ownership – No moving parts.
6. High Turndown (10:1)
7. Design Flexibility – Can be sized for line diameters ½” to over 120”.
8. No recalibration.

Disadvantages of other technologies when compared with V-Cone:

Orifice Plates:
1. High Installed Cost – requires 10 to 15 diameters of straight pipe runs, heavy support fittings.
2. Subject to abrasion and loss of accuracy when measuring dirty fluids.
3. Cannot accurately measure disturbed flow.
4. Not reliable for wet gas or condensate measurement.
5. Low Turndown (4:1)
**Averaging Pitot tube:**
1. High Installed Cost - requires 10 to 20 diameters of straight pipe runs.
2. Susceptible to plugging by particle-laden fluids.
3. Cannot accurately measure disturbed flow.
4. Not reliable for wet gas or condensate measurement.
5. Need flow conditioning to achieve stated accuracy.

**Venturi tube:**
1. High Installed Cost.
2. Susceptible to plugging by particle-laden fluids.
3. Low Turndown (5:1)
4. Not reliable for wet gas or condensate measurement.
5. Requires routing maintenance and periodic calibration.

**Ultrasonic flow meter:**
1. High Installed Cost.
2. Susceptible to plugging by particle-laden fluids.
3. Not suited to high temperature fluids.
4. Requires periodic recalibration to correct signal drift.
5. Subject to vibrations.

**V-Cone Applications:**
2. Blending – Liquids Hydrocarbons.
3. Burners – Natural Gas / LPG / LNG.
5. Compressors (Inlet / Outlet / Anti-Surge Control) – Natural Gas.
7. Fuel Gas – Natural Gas / LPG / LNG.
8. Well Head Measurement – Natural Gas.

**Conclusions:**
Differential Pressure meters are here to stay despite advances in vibrating tube meters, vortex meters. V-Cone units operate with mature principles but packaged a little differently, the increasing use of the device is solving many flow-related problems in the real world today and for the next millennium.

**References:**

1) **Hayward – A Basic Guide and Source Book for Users.**
2) **Szabo / Winarski Hypnar – V-Cone meter for Natural Gas Flows.**
3) **Miller – Flow Measurement Handbook**
4) **Lawrence – V-Cone Technology**
1) **Capacitance type Transmitters are best suited for**
   a. High temperature & pressure Services
   b. Acid & caustic services.
   c. Normal Temperature & pressure Services
   d. Varying Dielectric services.

2) **Displacer Type Level transmitter Works in the principle of**
   a. Archimedes
   b. Pascal's law
   c. Boyle's law
   d. Charles Law

3) **Displacer type level transmitters are affected by density:**
   a. True
   b. False

4) **The type of level measurement also called as Purge Type (dip tube)**
   a. Bubbler
   b. Radar
   c. Displacer
   d. DP

5) **Which type of Level instrument is best suited for inventory?**
   a. Displacer
   b. Bubbler
6) **Thermocouple works in the principle of**
   a. Stefan’s Boatman’s law
   b. Coronier effect
   c. Seebeck effect

7) **High temperature Measurement above 2000 deg C is done through Radiation**
   **Pyrometer:**
   a) True
   b) False.

8) **For low temperature which element is best suited**
   a. Pt-100
   b. J-Type Thermocouple
   c. K-Type Thermocouple.

9) **Bimetallic Thermometer works on the principle of**
   a. Millivolts
   b. Dissimilar metals
   c. Resistance change
   d. none of the above

10) **What is the common fill fluid used in thermometer?**
    a. Alcohol
    b. Mercury
    c. Acetone
ANSWERS:
1. a  
2. a  
3. a  
4. a  
5. c  
6. c  
7. a  
8. a  
9. b  
10. b