Setting the Standard for Automation™

ISA Delhi Section

PETROLEUM AND POWER AUTOMATION MEET 2017

Venue: EROS Hotel, Nehru Place, New Delhi

21st & 22nd April 2017

(FRIDAY & SATURDAY)

एनटीपीसी
NTPC
A Maharatna Company

एस. सी. पाण्डेय
निदेशक (परियोजनाएँ)
S.C. PANDEY
Director (Projects)

एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
NTPC Limited
(A Government of India Enterprise)
केन्द्रीय कार्यालय/Corporate Centre

Message

I am glad to note ISA Delhi Section is continuing with the tradition of successful organizing of the Annual PETROLEUM & POWER AUTOMATION MEET. Such efforts always create a learning atmosphere and is indeed a very good initiative by members of ISA Delhi Section. I am sure that all automation stake- holders in the past must have benefitted immensely by sharing the learning between two important industry segments of India's immensely important infrastructure segments, viz power and petroleum segment.

In the recent years, there have been many challenges in operations of power plants due to stricter emission norms as well as ramp up in renewable energy addition across nation. The demands of automation solutions in the Indian Industry has called for customization needs, suitable to the working conditions in our country. It is important that such technology oriented and context focused seminar, as being conducted by ISA Delhi Section, should be able to create significant contributions for the benefit of challenges the country is facing today.

I am sure that this platform will be satiating the learning desires of all the participants from the Power and Petroleum Industry.

I wish ISA Delhi Section all the very best for a successful event ahead.

(S.C. PANDEY)

एनटीपीसी भवन, कोर-7, स्कोप कम्प्लेक्स, 7, इंस्टीट्यूशनल एरिया, लोधी रोड, नई दिल्ली-110 003 टेलि/Tel. : 011-24361090, 24369151, फैक्स / Fax : 011-24363880
NTPC Bhawan, Core-7, SCOPE Complex, 7, Institutional Area, Lodhi Road, New Delhi-110 003. E-mail : scpandey00@ntpc.co.in, web site : www.ntpc.co.in
कार्पोरेट पहचान नम्बर/Corporate Identification Number : L40101DL1975GOI007966

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)
पंजीकृत कार्यालय : इंजीनियर्स इंडिया भवन, 1, भीकाजी कामा प्लेस, नई दिल्ली-110066
Regd. Office : Engineers India Bhavan, 1, Bhikaji Cama Place, New Delhi-110066

विपिन भण्डारी
निदेशक (मानव संसाधन)
VIPIN BHANDARI
DIRECTOR (HUMAN RESOURCE)

Message

It gives me immense pleasure to learn that ISA Delhi Section is once again organizing Petroleum & Power Automation Meet 2017 in Delhi on 21st and 22nd April 2017.

Automation in industry has become imperative, especially in this age of mass production requiring high precision. Automation in industry helps saves labor, energy, improves quality, accuracy and precision. Inevitably, the Oil & Gas and Power Industry is prioritizing technologies which drive meaningful efficiencies.

Automation Technology, specifically Instrumentation & Control is very crucial in Oil & Gas and Power Industry domains to generate efficiency and sustainability in the Oil & Gas processes as well as Power generation, by helping manage cost, extract the most value possible from current assets and maximize up-time.

Advances in automation technology in the Oil & Gas and Power industry have not only helped produce and transmit more safe and reliable energy but it has also provided various economic advantages.

It is at symposiums like these, that automation professionals in the industry can get together to brainstorm on future technologies, review systems and processes that need to be upgraded to increase efficiency and reliability in order to remain competitive in a dynamic industry landscape.

I am sure that this gathering of automation professionals under the umbrella of ISA Delhi Section, would provide the ever needed platform of information exchange, among the decision makers in the domains of industry.

As our country is striving for "Make in India", this is a good opportunity for Control and Instrumentation professionals from various domains of industry to participate in this conference and enhance their technical expertise, as ISA provides a unique platform to all the stake holders for sharing their knowledge, expertise and innovation.

I congratulate ISA Delhi Section on organizing this conclave and wish them every success in achieving dynamic strides in this journey of advancing Automation Technology for the growth of industry in India.

With Regards

V.Bhandari

(V. C. Bhandari)

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
रिफाइनरीज़ प्रभाग : स्कोप कॉम्प्लेक्स, कोर-2
7, इंस्टिट्यूशनल एरिया, लोधी रोड, नई दिल्ली-110003
Indian Oil Corporation Limited
Refineries Division : SCOPE Complex, Core-2
7, Institutional Area, Lodhi Road, New Delhi - 110003
Tel. : 91-11-24361205 Fax : 91-11-24361783
E-mail : chopras@indianoil.in
Website : www.iocl.com

सुरेश चोपड़ा
कार्यकारी निदेशक - प्रभारी (परियोजना)

Suresh Chopra
Executive Director - I/C (Projects)

Message

I am pleased to know that International Society for Automation – Delhi Section is organising **"Petroleum & Power Automation Meet 2017"** in New Delhi on the 21st & 22nd April 2017. The efforts of ISA-D in bringing together relevant stakeholders pertaining to Instrumentation and Automation are indeed commendable.

The initiative is well timed and much needed as oil & gas sector in the country, is battling multi-pronged challenges. The industry is making all out efforts to increase operational excellence by adopting cutting edge technologies in different facets of operations including safety and security. The conference therefore assumes importance as the country is emerging as an important oil and gas player in the global arena.

Automation is one of the key enablers for increased availability, reliability, safety and stability of the assets of plant efficiency. Considering the fact that the automation solutions pertaining to Oil & Gas and Power sectors are quite similar, I hope that this event will provide synergy between the solution providers and the end users in both Oil & Gas and Power sector. The forum will also provide an opportunity to share information and knowledge about the latest trends in the fields of Instrumentation and Automation. This will help both the sectors to adopt state-of-the-art systems and practices to achieve global benchmarks in critical areas.

I am also very confident that this knowledge sharing platform will act as a bridge of knowledge between the professionals from the Automation industry, Oil and Gas Sector, Power Sector, policy makers and academicians.

I extend my best wishes for the success of the event.

(Suresh Chopra)

INDRAPRASTHA GAS LIMITED

(A Joint Venture of GAIL (India) Ltd., BPCL & Govt. of NCT of Delhi)

Message

I am pleased to note that ISA Delhi Section is organizing Petroleum & Power Automation Meet 2017 in Delhi on 21st and 22nd April 2017. It is very good initiative by ISA Delhi Section to bring out Technical Papers presentation and Technical Workshop with wide spectrum of topics on emerging trends and challenges of the Petroleum and Power industry.

Energy is the most important input for our national growth and development. The Energy resources in the country have been under severe pressure due to the imbalance created in the demand and supply. With majority of raw materials being imported it is an area of concern for the country with regards to sustainability in the future. In such a case it is the Automation Technology that may help reducing this gap as well as become a major factor in meeting the sustainability needs of the petroleum and power sector in India.

In order to fulfil our future requirement, we need to go for rapid capacity addition using all the possible energy options including fossil, non fossil and renewable resources. It is praiseworthy to note that the use of automated system has entered many folds in the energy sector and increased availability, reliability, safety, and stability of the assets of plants. As we are now entering in to the world of Cloud computing and IOT we need to give more emphasis on issues like cyber security, data transfer and data base management.

It is a good opportunity for the Control and Instrumentation professionals to attend this conference to enhance the technical expertise as ISA gives a common platform to all the stake holders for sharing the knowledge and expertise.

Best Regards.

E S Ranganathan
Managing Director

IGL Bhawan, Plot No. 4, Community Centre, R.K. Puram, Sector - 9, New Delhi-110 022
Phone : 46074607 Fax : 26171863 Website : www.iglonline.net
CIN : L23201DL1998PLC097614
An ISO 9001:2008, ISO 14001 : 2004, OHSAS 18001 : 2007 Certified Organisation

Ramagundam Fertilizers And Chemicals Ltd.
रामागुण्डम फर्टिलाइज़र्स एण्ड केमिकल्स लिमिटेड
(A Joint Venture Company of NFL, EIL & FCIL)
Corporate Office: 4th Floor, Mohta Building, 4, Bhikaji Cama Palace, New Delhi-110066
Website : www.rfcl.co.in, Tel.: +91 11 26701400, Fax : +91 11 26180729
कारपोरेट कार्यालय : मोहटा बिल्डिंग, 4, भीकाजी कामा पैलेस, नई दिल्ली-110066
वेबसाईट : www.rfcl.co.in, दूरभाष : +91 11 26701400, फैक्स : +91 11 26180729

April 19, 2017

Message

I am pleased to know that ISA Delhi Section is organizing "Petroleum & Power Automation Meet 2017" in Delhi on 21st and 22nd April 2017. The efforts put by ISA Delhi Section in bringing End Users, Consultants, EPC Companies, Manufacturers, Field Instruments and System Vendors, System Integrators and other relevant stakeholders pertaining to Instrumentation & Control are indeed commendable. I congratulate ISA Delhi Section for hosting this all India event which is of prime importance to the entire industry.

At present India is a significant player in Global Energy scenario as an importer of huge quantities of Crude and LNG. India with its unique position as front line developing economy cannot but has to occupy center-stage in global energy arena. Present economic thrust has created the right environment for establishing major capital projects in power and petroleum sector and we are on the threshold of witnessing a prolific increase in launching of new major projects in this sector.

Petroleum and Power sectors are the backbone for any developing economy and in turn require highly qualified, experienced and trained professionals to drive the industry in most efficient and safe manner. I hope, the present event would result in extensive exchange of knowledge among the participants and would be instrumental in putting in place a knowledge regime which is driven by synergy across various domains of industries.

I extend my best wishes for the success of this "Petroleum & Power Automation Meet 2017".

Best Regards,

Vivek Malhotra
ED – EIL & CEO – RFCL

M essage

I am glad that we are able to continue in making this unique unprecedented platform of Petroleum & Power Automation Meet PPAM 2017, a Mega event on technology knowledge sharing among the End Users, Consultants, Manufacturers and Academicians organized by ISA Delhi Section at Hotel EROS, New Delhi on 21st and 22nd April, 2017

In our vast country, where technology and resource sustainability is being sought by the industry and Make in India is an area of concern for the Government with regards to sustainability in the future, it is the Automation Technology that may help reducing this gap as well as become a major factor in meeting the sustainability needs of the petroleum and power sector in India the major energy resources.

In the present world scenario meeting the energy challenge is of fundamental importance to our economic growth targets and its efforts to raise its level of human development. This demand must be met through safe, cleanforms of energy at the competitive cost in an efficient, economically viable and environmentally sustainable manner.

It is appreciable to note that with enhanced features of automation, we have increased availability, reliability, safety, and stability of the assets of the petroleum and power plants.

It is a good opportunity for the Control and Instrumentation Engineers to attend this conference to enhance the technical expertise as ISA gives a common platform to all the stake holders for sharing the knowledge and expertise.

I sincerely thank all sponsors, contributors of the Technical papers and to all members of organizing committee who despite their huge workloads at their respective organization have worked very hard to make this event a grand successful event.

With Best Regards

M P Singh
Honorary President
ISA Delhi Section

Message

Automation is the dependence backbone of any industry looking to optimise on asset utilisation, to leverage efficiency management and maximise revenue generation. Indeed automation experts in the past have said that what can be measured can be controlled and consequently what can be controlled can be leveraged & managed for the betterment & advancement of mankind.

Today the energy sector stands ate the cross-roads of History we are all seeing a paradigm shift - a change that will perhaps see the survival & progress of mankind into the next few decades. We are all facing the challenge of optimising our utilisation of every form of energy with the highest possible efficiency and thereby ensuring the sustainable development of this world and all of us .

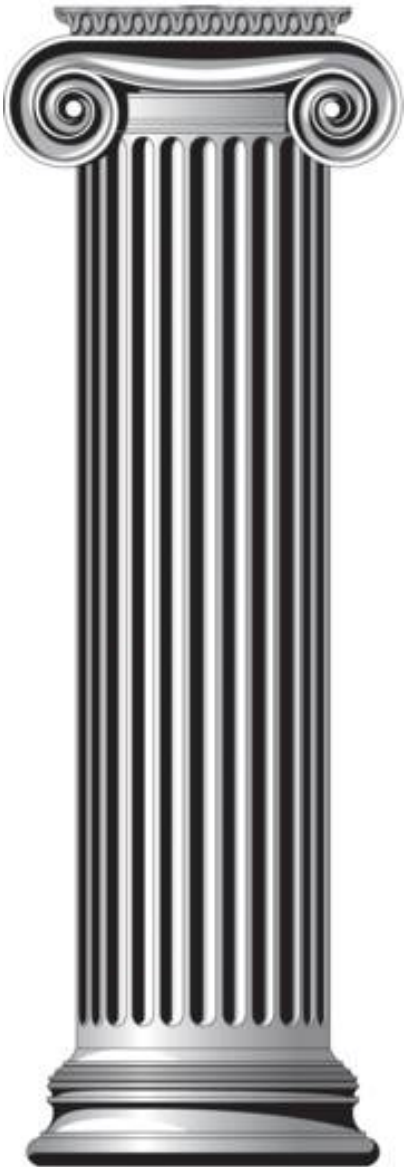
Automation systems are therefore critically important and the development and application of the optimum automation technology in every sphere of life and every industrial activity is an essential part of human existence. At this time in the history of mankind, the role of organisations like the International Society of Automation (ISA) becomes all the more relevant. The Petroleum and Power Automation meet 2017 is a humble effort on the part of ISA Delhi section to help build upon the knowledge repository of automation experts by promoting the process of mutual learning by sharing of knowledge among industry experts & peers.

I wish all success to this event. I am confident that this two day Technology meet will be a great learning experience for all of us practising automation professionals from the field of Power as well as the Petroleum sector.

With Best Regards

PRASENJIT PAL
Chief Convenor
PPA Meet 2017

ISA Delhi Section



The International Society of Automation (ISA)

Founded in 1945, the International Society of Automation (ISA) is a leading, global, nonprofit organization that is setting the standard for automation by helping over 30,000 worldwide members and other professionals to meet, interact and share their knowledge. Based in Research Triangle Park, North Carolina, ISA is organised into 14 districts and hundreds of sections across the world. The South East Asia region is designated as District-14 and within this district, the Delhi Section is an active organization drawing members from the entire spectrum of automation industry across Power, Oil & Gas, Metallurgy, Chemicals & Fertilizers including the Engineering fraternity from Consultants, EPC Contractors, Automation Component Suppliers & Equipment Manufacturers, System Integrators and many other industries.

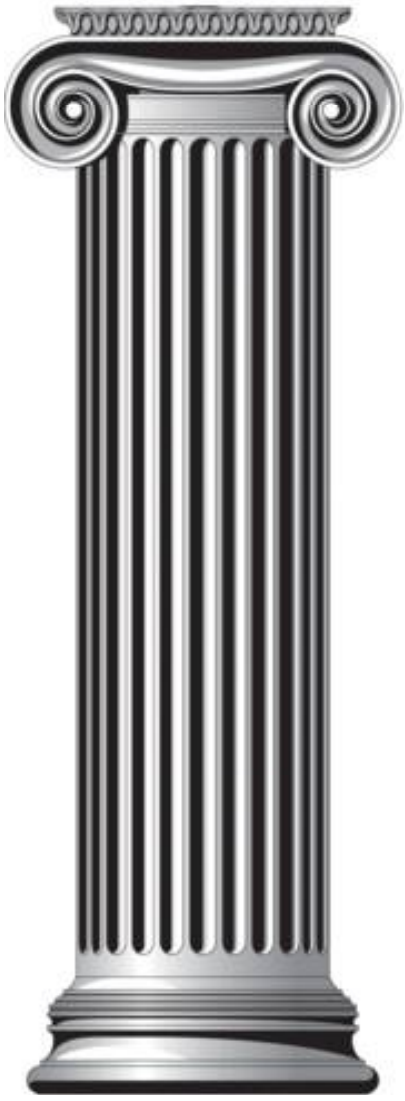
ISA has been involved in promoting emerging technologies across the globe by a variety of ways such as:

- Developing and updating standards for existing & evolving technologies in automation related fields ;
- Publication of Text-books, hand-books, journals, proceedings etc. on a wide array of automation related subjects from primary field sensors to integrated automation and management systems for various kinds of plants & processes;
- Facilitating Interface & interaction with other agencies like IEC, IEEE, EPRI, ASME and others to develop and maintain automation related standards with regular updating, keeping pace with the march of technology in various fields;
- Organising Training, Seminars/Workshops, Webinars and Exhibitions
- Carrying out certification programs for technicians, engineers and senior professionals.
- Recognizing the talented and the dedicated professionals in the field of Automation through various honours and awards
- Enabling Interaction with Student members, formation of student section and annual scholarships, competitions etc. are many interesting student programs of the ISA.

The ISA Delhi Section - ISA(D)

ISA Delhi Section had been formed almost a decade back and has progressed well since then with a membership of more than 350 and growing. ISA Delhi Section had taken many initiatives in the past including organizing two exhibitions ISA (D) EXPO' 05 & '07, a large number of seminars and workshops on emerging technologies. Regular Monthly technical exchanges on diverse topics are organised for the benefit of all members of ISA(D), thereby increasing the knowledgebase & technical capabilities of members.

ISA Delhi Section



ISA Delhi Section has taken quite a few initiatives in the recent past to better address the need for knowledge sharing among industry specific groups of Automation Engineers. Notably, within the overall ambit of ISA(D), two industry specific interest groups have already been created, one for the Power Industry namely Power Automation Technology group(or POWAT) and one for the Oil & Gas Industry called Petroleum & Natural Gas Industries Automation Domain(PNID). ISA (D) is also encouraging the farmation of a systems integrators forum, so as to share the vast scattered knowledge base resources of systems intergrators community.

ISA Standards

Practical Solutions from Industry Experts

ISA Standards help automation professionals streamline processes and improve industry safety, efficiency, and profitability. Over 150 standards reflect the expertise from over 4,000 industry experts around the world. Since 1949, ISA has been recognized as the expert source for automation and control systems consensus industry standards.

Key Features, Advantages, and Benefits of Standards

Realize a direct return on investment by

- Lowering installation and start-up costs
- Reducing need to maintain large inventories
- Enabling interchangeability of components
- Improving design with less "custom" effort
- Increasing safety

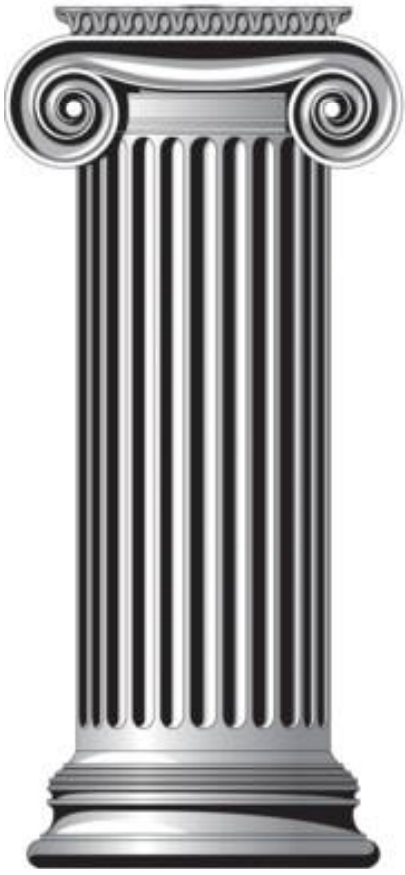
Use of standards in industry

- Improves communication
- Provides practical application of expert knowledge
- Represents years of experience and avoids necessity of starting each project from ground up

Standards help you achieve operational excellence by

- Improving performance
- Lowering maintenance costs
- Reducing downtime
- Enhancing operability
- Saving money

ISA Delhi Section



ISA's Role in Developing Standards

More than 4,000 individuals cooperating with more than 140 committees, subcommittees, working groups and task forces are involved in ISA standards. They're developing standards in areas as diverse as ensuring the safety of electrical equipment used in hazardous locations to cost-savings for interfaces between industrial process control computers and subsystems.

How a Standard Saves Money

ISA's batch control standard illustrates how using a standard cuts costs. Food, pharmaceutical and specialty chemical companies build factories with increasingly sophisticated computer-driven automation. The batch standard ISA developed-ANSI/ISA-88.00.01 - shaves as much as 30 percent off the cost of designing the system and software used in these plants. ANSI/ISA-88.00.01 sets out a blueprint that engineers can use to make portions of the code interchangeable, which is less expensive than designing each piece from the ground up.

The savings extend beyond the facility's design, though. By using the batch standard, companies save as much as 10 to 15 percent off the typical cost of meeting Food and Drug Administration criteria for the reliability of automation equipment.

How a Standard Saves Lives

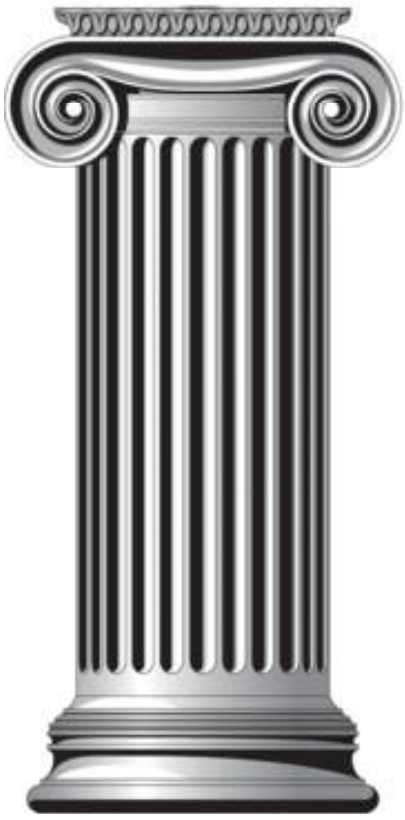
Other ISA standards focus on safety. ISA has developed standards for the performance requirements of toxic gas detectors, standards to keep electrical equipment from igniting flammable material and standards to ensure safety at nuclear power plants.

And some ISA standards can help an entire industry combine cost savings and safety. The most popular ISA standard is ANSI/ISA-5.1, Instrumentation Symbols and Identification. Developed in 1949 and most recently revised in 2009, these symbols are used in blueprints for everything from power plants to factories. If every contractor on a project knows the standard symbols, there are fewer communication problems that could lead to costly delays or safety problems.

Using Standards to Help Your Business Expand Globally

Your company has a product that's taken the United States by storm; now you want to expand globally. But there is a hitch or, as the engineers might tell you, a "technical barrier to trade." Your company's product, or the process by which it's made, doesn't meet international standards. Many ISA standards are also international standards, and our committees strive to stay current with evolving global standards. ISA administers three committees for the International Electro technical Commission (IEC), which is one of the two most widely recognized international standards groups, along with International Organization for Standardization (ISO).

ISA Delhi Section



How Your Company Can Take Advantage of ISA's Standards

- Buy ISA standards and train your employees to follow it.

- Help set a standard. ISA's committees are eager for help. Both voting and non-voting memberships are available. Voting members must have their employers' approval, in part because attending at least one meeting a year is expected. But we're cutting down on the time demands of committee membership by encouraging members to do a great deal of their work via e-mail. Non-voting members supply input but are not required to attend meetings. Apply online to volunteer.

Students

Students can come to automation from a variety of backgrounds and academic programs. It is sometimes difficult for you to find programs that concentrate on automation as a career or specialty. This potential variety can create challenges for students like you that are not seen in many areas of studies.

The essence of automation is that it is a multidisciplinary art, not a single discipline. You are required to know a lot about many things to function as an automation professional. Automation studies are rarely centred in one department. Automation students and faculty on a campus could come from any number of engineering areas. That means that published findings could appear in a number of journals and presented at a myriad of scientific conventions. This diversification makes it extremely difficult for students to stay current on the newest findings. It also means that you need to have a very open outlook on what will make you a good automation professional.

The ISA web site helps students more easily stay current on research without attending numerous expensive conventions or wading through non-automation related literature for the useful gems. Also, students can find the conferences they should attend to both gain information and networking possibilities, which can lead to job possibilities.

The ISA web site contains the Automation Body of Knowledge, from the very basics of sensors and controls to the most detailed industrial networking, enterprise integration, cyber security and safety information. When you have digested that Body of Knowledge, you will be ready to be a Certified Automation Professional, and you can find the tutorials and test materials here to help you.

The ISA Mentor Program for Young Professionals and Students

ISA's Mentor Program enables young professional ISA Members and Student Members to access the wisdom and expertise of seasoned ISA Members, while it offers veteran ISA professionals the chance to share their wisdom and make a difference in someone's career. A

mentor can give a young professional guidance in his or her career or help a student determine if automation and control is the right path to follow.

ISA's Mentor Program is an online program, so there are no meetings to attend and there is no travel. ISA Members from all over the world can participate, and the relationship can develop and progress at the convenience of the mentor and protégé.

ISA Members are encouraged to register and participate in the program as mentors. Find out more about becoming a mentor.

ISA's younger Members and Student Members are urged to use this valuable Member benefit. Find out more about getting an ISA Mentor and how to select a mentor.

ISA™

ISA Delhi Section

2016-2017 ISA Section Leaders

Name of Section: ISA DELHI SECTION **District #:** 14

Person Completing Form: M P SINGH **Position:** President

Effective Date Leaders Take Office: 11/04/2016

Position	Name	Mem. #	E-mail Address
President (3130)	M P Singh	32046378	mp1.singh@jalindia.co.in
President-elect (3150)	S K Dhawan	33187323	sk.dhawan51@yahoo.co.in
Vice President (3390)	DharmenderSinghal	33047333	dhsi@topsoe.in
Secretary (3250)	Ashish Manchanda	33042943	ashishcontact@yahoo.co.in
Treasurer (3350)	Parag Tyagi	33129449	paraag@wissenautomation.com
Delegate (1370)	Arun Gupta	32929694	arung@indure.com
Alt. Delegate (0030)	Anil Chaudhary	32247401	anil@elconsys.com
Program Chair (0950)	Naresh Makhija	33233676	nareshmakhija@ppd.bgrenergy.com
Education Chair (1350)	Rajeev Khanna	32247969	rajeevkhanna@ntpc.co.in
Membership Chair (0790)	Sachin Joshi	33282834	sachin.joshi@eil.co.in
Newsletter Editor (2970)	Manish Kumar	33080951	manish.kumar@eil.co.in
Web Master (3420)	Radheyshyam Tiwari	33146408	radheytiwari@gmail.com
Exhibit Chair (0430)	N Rajesh	33614368	nrajesh@indianoil.in
Marketing Chair (1010)	Sandeep Gupta	32899578	totalsolutionsco@yahoo.co.in
Publications Chair (0970)	AnujaThukral	33173214	anuja.thukral@gmail.com
Honors & Awards (0510)	S Mahesh Kumar	32978456	s.mahesh.kumar@eil.co.in
Historian (1990)	AmanSagar	32970471	aman_sagar44@yahoo.com
Student Section Liaison (2870)	C Saroj	33187332	csaroj@ntpc.co.in
Past Section President (3090)	Rajiv Gupta	33158320	rajiv.gupta@eil.co.in
Other (2950) Sr. Advisor	R G Dhalwani	32205732	rgdhalwani@gmail.com
Other (2950) Sr. Advisor	Rohit Bhardwaj	33026902	rohit_iocl@yahoo.co.in
Other (2950) Sr. Advisor	AlokSrivastva	32247966	alokshrivastava@ntpc.co.in
Other (2950) Sr. Advisor	Prasenjit Pal	32156518	prasenjit@ntpc.co.in
Other (2950) Sr. Advisor	S K Bardhan	32930445	bardhansk@yahoo.co.in
Other (2950) Sr. Advisor	Atish Chakraborty	32899583	chakrabartya@indianoil.in
Other (2950) Sr. Advisor	S R Bhatnagar	32156515	sheel.bhatnagar@emerson.com
Other (2950) Sr. Advisor	R Priyamvada	32191437	priyamvada.r@eil.co.in
Other (2950) Sr. Advisor	Arundhati Bhattacharya	33158320	arundhatib@ntpc.co.in
Other (2950) Sr. Advisor	R Sarangapani	32986108	rsarangapani@ntpc.co.in
Other (2950) Sr. Advisor	S Samanta	33137156	somnathsamanta@ntpc.co.in
Other (2950) Sr. Advisor	M K Srivastava	32247965	mksrivastava01@ntpc.co.in
Other (2950) Sr. Advisor	Ramphal	33614369	ramphal2@indianoil.in
Other (2950) Sr. Advisor	N K Pande	04117201	pande.nk@gmail.com
Other (2950) Sr. Advisor	Ravinder Goyal	32180883	rgoyal@vsnl.com
Other (2950) Sr. Advisor	R K Bassi	32941231	rkbassi@yahoo.com
Other (2950) Sr. Advisor	S Sudershan Rao	33117790	ssrao46@gmail.com

Team ISA Delhi

Sh. M P Singh
Hon. President

Sh. S K Dhawan
President Elect

Sh. Dharmender Singhal
Vice President

Dr. Ashish Manchanda
Hon. Secretary

Sh. Parag Tyagi
Treasurer

Sh. Arun Gupta
Society Delegate

Team ISA Delhi

Sh. Anil Chaudhary
Alt. Delegate

Dr. Naresh Makhija
Program chair

Sh. Rajeev Khanna
Education Chair

Sh. Sachin Joshi
Membership chair

Sh. Manish Kumar
Newsletter Editor

Sh. Radheyshyam Tiwari
WebMaster

Team ISA Delhi

Sh. N Rajesh
Exhibit Chair

Sh. Sandeep Gupta
Marketing Chair

Sh. AnujaThukral
Publications Chair

Sh. S Mahesh Kumar
Honors & Awards

Sh. Aman Sagar
Historian

Smt. C Saroj
Student Section Liaison

Team ISA Delhi

Sh. Rajiv Gupta
Past Section President

Sh. R G Dhalwani
Sr. Advisor

Sh. Rohit Bhardwaj
Sr. Advisor

Sh. Alok Shrivastava
Sr. Advisor

Sh. Prasenjit Pal
Sr. Advisor

Sh. S K Bardhan
Sr. Advisor

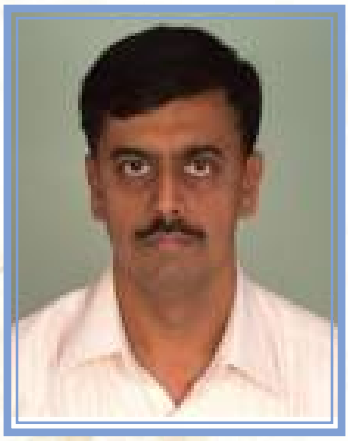
Team ISA Delhi

Sh. Atish Chakraborty
Sr. Advisor

Sh. S R Bhatnagar
Sr. Advisor

Smt. R Priyamvada
Sr. Advisor

Smt. Arundhati Bhattacharya
Sr. Advisor



Sh. R Sarangapani
Sr. Advisor

Sh. S Samanta
Sr. Advisor

Team ISA Delhi

Sh. M K Shrivastava
Sr. Advisor

Sh. Ramphal
Sr. Advisor

Sh. N K Pande
Sr. Advisor

Sh. Ravinder Goyal
Sr. Advisor

Sh. R K Bassi
Sr. Advisor

Sh. S Sudershan Rao
Sr. Advisor

NAGMAN
Since 1972

NAGMAN
INSTRUMENTS & ELECTRONICS (P) LTD.
CHENNAI, INDIA.

EXPORTED TO 94 COUNTRIES

TEST, MEASUREMENT & CALIBRATION INSTRUMENTS

METROLOGICAL DRY BLOCK TEMPERATURE CALIBRATORS

Sub-Zero, Medium & High Temperature Ranges

PNEUMATIC & HYDRAULIC PRESSURE CALIBRATORS

Various Ranges from -0.85 to 2 bar & upto 1000 bar

PNEUMATIC & HYDRAULIC DEAD WEIGHT TESTERS

Ranges: Pneumatic upto 35 bar & Hydraulic upto 1200 bar

COMPARISON TESTERS

Ranges upto 1400 bar

SIGNAL CALIBRATORS

To Measure and/or Simulate DC Voltages, DC Current, Frequency, Resistance, Thermocouple & RTD

CALIBRATION TEST BENCHES & WORKSTATIONS

Primary Standard Calibration Test Bench
Secondary Standard Calibration Test Bench
Electrical & Electronics Calibration Test Bench
Multifunction Calibration Test Bench
Water Meter Test Bench
Process Flow Meter Calibration System

CENTRE FOR CALIBRATION

LAB & SITE / FIELD CALIBRATION
Accredited by NABL, New Delhi, India
(as per ISO/IEC 17025:2005 Standards)

C-162, C-163, C-164, C-1212

for

THERMAL, MECHANICAL ELECTRO-TECHNICAL & FLUID FLOW *Parameters*

CHENNAI • MUMBAI • NEW DELHI • VADODARA • VIZAG

SPECIALISTS IN
CONSULTANCY FOR SETTING UP CALIBRATION LAB
TRAINING WORKSHOPS ON CALIBRATION MANAGEMENT TECHNIQUES

ISO 9001 BUREAU VERITAS Certification
IND16.8095/U/Q
AN ISO 9001 CERTIFIED COMPANY

mktgchennai@nagman.com • www.nagman.com

45 YEARS OF DEDICATED SERVICE TO INDUSTRIES WORLDWIDE

DNV CERTIFIED

CROUSE-HINDS
SERIES

Controlling, operating and protecting assets in harsh and hazardous areas

More protection. More technology. Expect more.

Eaton is committed to providing you the best in safety, reliability, availability, quality and value, offering a comprehensive range of trusted MTL solutions that improves your business performance and increases profitability.

Our wealth of experience in the development and supply of intrinsic safety protection devices reduces risk and delivers the confidence you need to improve for operational safety and performance. Today our product range is one of the most diverse in the process control industry. With a wide choice of world class **MTL fieldbus** solutions to **MTL industrial security**, **MTL wireless**, **MTL surge protection**, **MTL HMIs**, **FSM approved MTL Isolators** and **Barriers** we are ready to simplify your project complexity with the most reliable products and solutions on the market.

Our MTL products, part of Eaton's Crouse-Hinds series portfolio, are installed in all types of location, both hazardous and general purpose, from offshore oil and gas platforms, power production plants and petrochemical installations through to pharmaceuticals. With many of the world's safety critical processes already monitored, controlled, visualized or protected by MTL products assures **you are safe in our hands.**

- **MTL intrinsic safety**
- **MTL signal conditioning**
- **MTL HART® interfacing**
- **MTL process I/O™**
- **MTL fieldbus**
- **MTL industrial ethernet**
- **MTL industrial security**
- **MTL industrial wireless**
- **MTL HMI & visualisation**
- **MTL surge protection**
- **MTL process alarm equipment**
- **MTL gas analysers**

EATON
Powering Business Worldwide

www.mtl-inst.com mtlindiasales@eaton.com

www.chemtrols.com

Chemtrols

Engineering | Projects | Manufacturing | Technology

Engineering Growth

Chemtrols Industries Pvt. Ltd. is a leading Solutions' provider in managing the manufacturing processes of varied industries with ingenious solutions.

The **ISO 9001:2010** company provides specialized system integration services to industries like the Oil & Gas, Cement, Power, Fertiliser, Chemicals & Petrochemicals etc. in India and the international market, with highest standards of excellence.

Expertise

Analytics

- Process Analytics
- Continuous Emission Monitoring Systems
- Ambient Air Quality Monitoring Systems
- Flame & Gas Detection Systems

Terminal Automation

- Wagon & Truck Loading Systems
- Security Surveillance: CCTV & Access Control Systems
- Tank Farm Management & SCADA

Metering & Measurement

- Flow
- Metering Skids For Liquids & Gases
- Level
- Density
- Temperature
- Moisture
- Mechanical
- Oxygen Analysers

Steam Engineering

- PRDS & DUMP PRDS
- DeSuperheaters
- Control Valves
- Turbine Bypass Valves

Utility Management Systems

- Power Grid Network Management
- Power Distribution Network Management
- SCADA
- Monitoring & Control RTU's & FRTU's for Substation & RMU's

Chemtrols Industries Pvt. Ltd. Amar Hill, Saki Vihar Road, Powai, Mumbai - 400 072 INDIA
Tel : +91-22-6715 1200, 2857 5089, 2857 0557, Fax : +91-22-2857 1913, Email : chemtrols@chemtrols.com, Web : www.chemtrols.com

Network Offices : Mumbai, Vadodara, Begaluru, Chennai, Delhi, Vizag, Guwahati, Kolkata, Secunderababd & Jebel Ali (Middle East)
Registered Office : 910, Tulsiani Chambers, 212, Nariman Point, Mumbai - 400 021 INDIA T:+91-22-22830636, F:+91-22-2287 3573.

We Connect the Field to Your Control Room

Innovations Tailor-made for your Industry

Phoenix Contact offers a comprehensive portfolio of hardware and software for the future-proof automation of the sometimes outdated installations involved in the production, transport, and processing of oil and gas.

Make production more efficient and minimize failures with these turnkey solutions which support flexible expansion and include control and remote control technology, safety and Ex-i components, surge protection, and industry-specifc software.

Customized solutions include Oil field Monitoring, Valve Management, Flow Calculation Libraries, Tank farm Monitoring and customer-specific developments.

PHOENIX CONTACT
INSPIRING INNOVATIONS

HEAD OFFICE
Phoenix Contact (India) Pvt. Ltd.
F-26/2, Okhla Industrial Area, Phase-II
New Delhi 110 020 INDIA
Tel: +91-11-30262700/800
Fax: +91-11-41611070/71
E-mail: adverts@phoenixcontact.co.in
Website: www.phoenixcontact.co.in

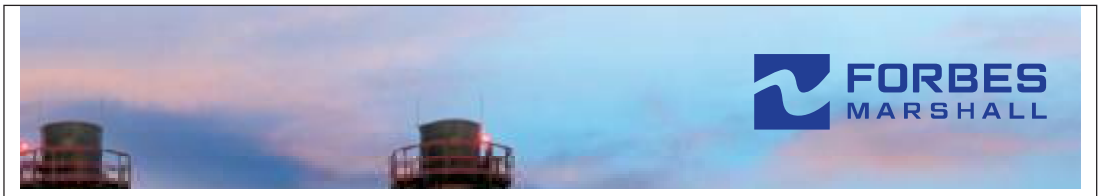
SOUTHERN INDIA OFFICE
411, Barton Centre
84, M.G. Road, Bengaluru 560 001
Tel : +91-80-30577400-406
Telefax: +91-80-25581312

WESTERN INDIA OFFICES
30, Shaswat Bungalow, 1st Floor
Ceaser Road, Amboli
Andheri [W], Mumbai 400 058
Tel.: +91-22-31901500 / 2772 / 3334

404-405, City Point
Dhole Patil Road, Pune 411 001
Tel.: +91-20-30581224-33
Fax: +91-20-30523637

www.facebook.com/PhoenixContactIndia


Tough Flow Metering Solutions
for Rough Environments
FLEXIM's ultrasonic clamp-on
flow meters for Oil&Gas
flow measurement
in hazardous areas Offshore
Exact and highly reliable bi-directional Oil&Gas flow measurement over a wide turndown ratio
Extremely cost efficient: No process shut down for installation required, virtually maintenance free as well as independent of line size and material
Expressively designed for usage in hazardous environ ments Offshore – rugged, seawater resistant Stainless Steel (SS316) solutions
External flow measurement: High operational safety, no clogging, no pressure losses, no risk of leaks
Exemplary usability: Independent of entrained particles or wet gas with Liquid Volume Fractions up to 5%
FLEXIM
FLEXIM Instruments Asia Pte Ltd ▪ India Liaison Office ▪ German Centre, 12th Floor, Unit No. 25, Building No. 9,
Tower B, DLF Cyber City, Phase III, Gurgaon ▪ 122 002 Haryana ▪ India ▪ salesindia@flexim.com ▪ M +91 9811 4 49285



Integrated Solutions for Reliability of Rotating Machines and Optimised Operations

Everyday vast quantities of oil and gas are transported across the globe, refined and transported further. When the stakes are high, any amount of unaccounted hydrocarbon or poor quality hits the bottom line. With expertise in machinery condition monitoring systems, steam and water analysis systems, sample conditioning, analysers, sample coolers the dedicated team of experts from Forbes Marshall helps customers identify and reduce losses, extend the life of the rotary equipment and improve margins.

We have vast experience with renowned names in the Industry, and provide solutions in Utility and Process. Our unique approach of Knowledge, Service and Products helps us provide optimum solutions through a variety of services such as audits, surveys, consultancy and training.

To know more about our comprehensive range, write in to us on response@forbesmarshall.com.

Energy Conservation | Environment | Process Efficiency www.forbesmarshall.com

P B # 29, Mumbai Pune Road, Kasarwadi, Pune 411 034, India. Tel. +91 20 27145595, 39858555, Fax. +91 20 27147413
A-34/35, M.I.D.C., H Block, Pimpri, Pune 411 018, India. Tel. +91 20 27442020, 39851100, Fax. +91 20 27442040

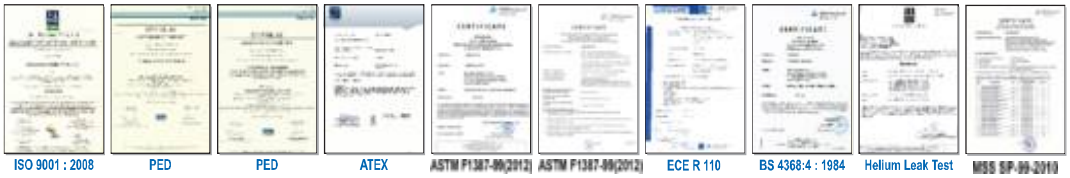
Forbes Marshall	Forbes Marshall Arca	Codel International	Krohne Marshall	Forbes Solar	Forbes Vyncke	Forbes Marshall Steam Systems

SEALEXCEL® (INDIA) PVT. LTD.

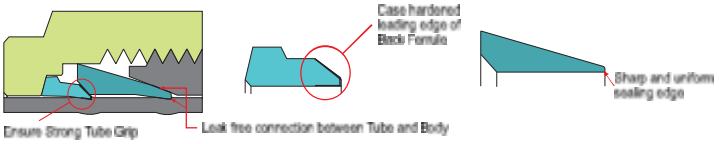
Cost Effective & best Quality Tube Fittings and Valves

SEALEXCEL™ has over three decades of experience and expertise with advanced technology in Design, Development and Manufacturing World Class Consistent and reliable quality Tube Fittings and Valves in Material SS316, 6MO, Inconnel, Hestalloy, Monel, Duplex etc. for CNG, Instrumentation, Hydraulic and Pneumatic applications and catering to the regular requirements of our Customers in India as well as Australia, Europe, Middle East, South Africa, USA etc.

SEALEXCEL's total quality system and control has earned us various quality and type approval certifications.



FEATURES OF FRONT AND BACK FERRULES



- Ensure strong Tube grip.
- Excellent Vibration Resistance.
- Leak free Gas Seal.
- Ensure leak free connections between Tube and Body
- High performance and Safety under high pressure and deep vacuum conditions.

- *The Features of SEALEXCEL™ Tube Fittings and Valves meets the international technical specifications requirements such as ASTM F1387-99(2012), ECE R110, MSS SP-99-2010 etc.*
- *The Advantage is World Class consistent high quality products ensuring maximum reliability, safety and high performance under adverse, harsh and stressful environments like vibration, high pressure, deep vacuum and thermal shock etc.*
- *The Benefit is Best quality Tube Fittings and Valves at competitive price and Best Delivery schedule.*
- *SEALEXCEL™ Tube Fittings and Valves are comparable with internationally renowned manufacturers such as Swagelok™, Parker™, A-Lok™, Gyrolok™ etc. with regard to quality, consistency, reliability, performance and safety*

We urge you to rely on SEALEXCEL™ products, provide us an opportunity to serve your esteemed organisation and avail substantial cost saving

Regd. Office & Unit-I : 56 B /8, Veena Dalvai Industrial Estate, S. V. Road, Oshiwara, Jogeshwari (west), Mumbai - 400 102. India.
Phone : +91-22- 2678 6885, 6694 4124 Fax : +91-22- 2678 5426, 6694 4126 E-mail : sales@sealexcel.com Website : www.sealexcel.com
Unit-II : At Village - Mahi, Pirojpura - Mahi Road, Via Chhapi, Taluka-Vadgam, Dist.-Banaskantha, North Gujarat, Pin-385210 INDIA

For more information, please visit our website
www.sealexcel.com

AXIS

We think Globally and act Locally

Analytical & Instrumentation Systems

Analyser Shelter
Gas Analysis System
Steam & Water Analysis System
Hazardous Area Panel
Air Conditioning Unit
Heating Ventilation & Air Conditioning Unit

- Shelter as per IEC Zone 1 or 2 • SS/GI as Option
- Interlock ribbed design • Multiprobe system
- IP 65 classified • As per EPA guideline
- Effective temp. & pressure reduction
- Open Rack or Walk through type
- Wet & Dry section separate • Purge Panel (Ex-p)
- Flame Proof Panel (Ex-d) • Intrinsically Safe Panel (Ex-i)

Plot No. 324, Road No. 5, G.I.D.C., Kathwada, Ahmedabad-382 430. I E-mail: info@axisindia.in I www.axisindia.in

MAXIMUM DURABILITY, PERFORMANCE AND VALUE WITHOUT THE MESS

"CHANGING THE SOLID LEVEL MARKET CONSTANTLY FOR OVER 3 DECADES"

EIP ENVIRO LEVEL CONTROLS PVT LTD
B-45, SECTOR-8, NOIDA-201301, (INDIA)
MOB: 9818953473
TEL. NO. : 91-120- 4243333
EMAIL: rajat@eipenviroindia.com

www.eipenviroindia.com

Swagelok

Now take fluid system assemblies off your to-do list

With Swagelok® Custom Solutions, we can build your fluid system assemblies for you, taking your team from design to fabrication in one step. Talk to us today!

Swagelok Bangalore | Chennai | Delhi | Hyderabad,
Head office: #1, Doddanakkundi Industrial Area, Whitefield Main Road, Mahadevapura Post, Bangalore - 560048,
Email: marketingbangalore@swagelok.com, Web: https://bangalore.swagelok.com/ https://delhi.swagelok.com

ADVANCE VALVES

Changing the way you think about valves

Your Complete Automated & Instrumentation Butterfly Valve Solutions Partner

Full range of Triple Offset Valves & Soft Seated Butterfly Valves

Size: 2" to 120" Class #125 to #900

Excellent track record of Actuated Valves for both CONTROL and ON/OFF applications.
Supplies (Pneumatic, Electric and Electro-Hydraulic) include to IOCL, GASCO, PDO, Reliance, Saudi Aramco, Cairn, Alstom Power, Samsung, Technip, AquaTech, VA-Tech, L&T and many more.

This has been made possible because of:

- Qualified in-house instrumentation & safety engineering team.
- Automated in-house test facilities for complete functional and performance testing.
- Strong relationship with qualified global actuator and accessory manufacturers.
- Well established globally approved QA/QC program ensures supply of quality products to our clients.

DUAL PLATE CHECK VALVES | BUTTERFLY TRIPLE ECCENTRIC VALVES | BUTTERFLY DOUBLE ECCENTRIC VALVES | BUTTERFLY CONCENTRIC VALVES | BALANCING VALVES

CRYOGENIC SERVICE | FIRE SAFE SERVICE | LOW FUGISTIVE EMISSION SERVICE

USA | UK | Spain | France | Italy | Saudi Arabia | UAE | Kuwait | Singapore | Malaysia | Korea | Japan | Australia

CE 10062 609-0071 LISTED

info@advancevalves.com | www.advancevalves.com

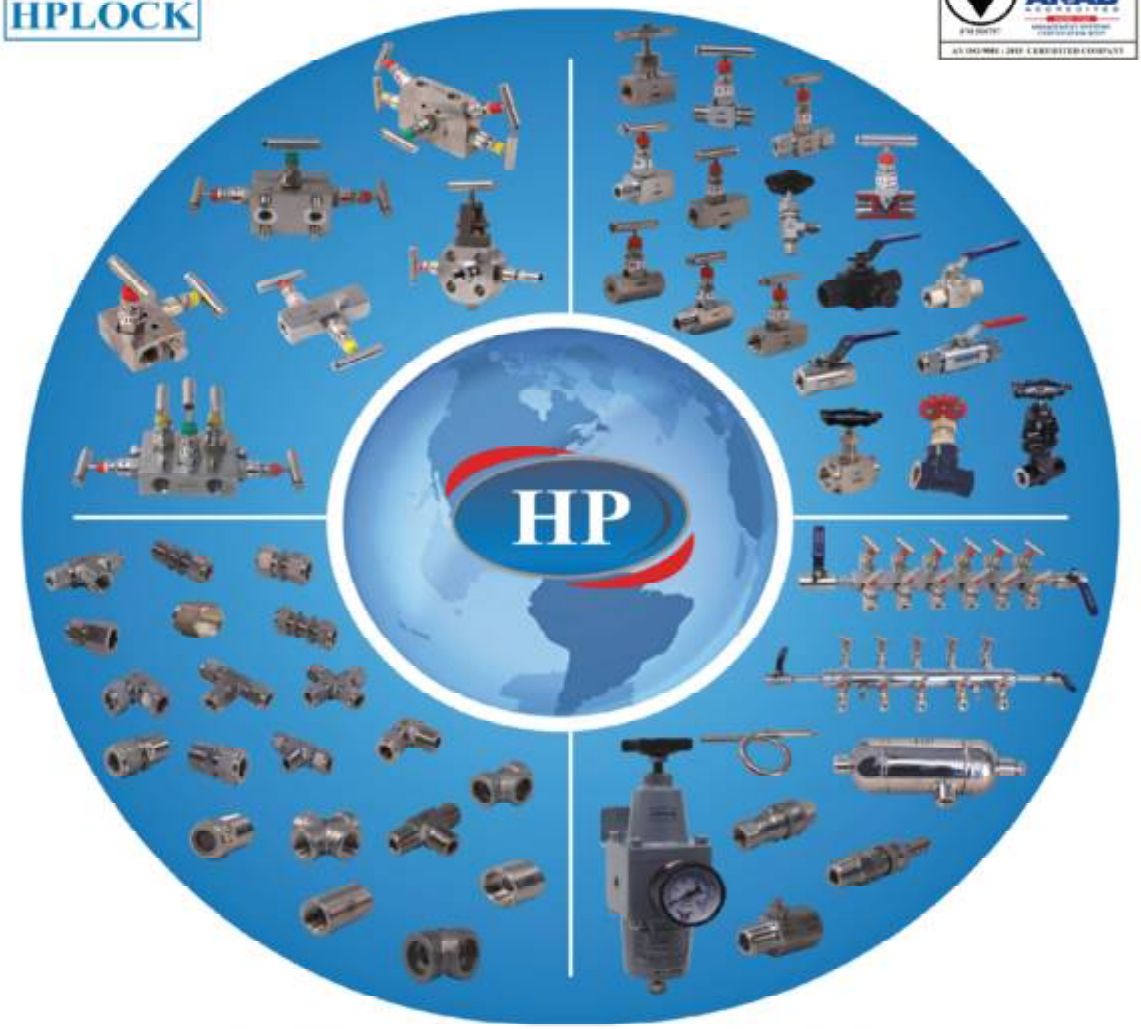
HP VALVES & FITTINGS INDIA PVT. LTD.

MFRS: IBR, NON IBR, HYDRAULICS, PNEUMATICS, INSTRUMENTATION VALVES & FITTINGS

AN ISO 9001 : 2015 CERTIFIED COMPANY

B-11, Mogappair Industrial Estate, Mogappair West, Chennai - 600 037, India.
Tel : 91 44 26252537 | Mob: +91 9840222338
E - Mail : sales@hpvalvesindia.com | hpvalves@vsnl.net
Website : www.hpvalvesindia.com

HPLOCK®



World Leader in Process Control Technology

Analyser Instrument Co. Pvt. Ltd.

Innovative Analysis Solutions

Dilution, Hot Extractive & In-Situ CEMS

For Measurement of CO, CO2, NOx, SO2, O2, CH4, THC, Mercury, Dust (SPM), HF, H2S, HCL, NH3 & Others

Steam & Water Analyser Systems (SWAS) & Effluent Monitoring System (EQMS)

Online PH conductivity, Dissolved Oxygen, Silica, Sodium, Hydrazine, Phosphate, Online Chloride, Ammonium, BOD, COD, TOC, TSS & Others

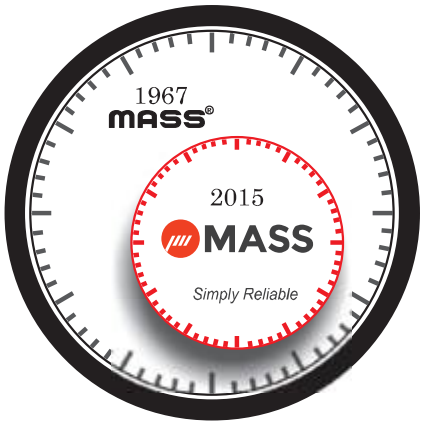
Process Gas Analysis Systems Package

Analyser System Package for Process Analysis at Fertilizers Cement, Steel, Power, Petrochemicals and other applications Including Shelters with Heating, Ventilation and Air Conditioning System

E-29 (A), Road No.2, Indraprastha Industrial Area, Kota 324005, Rajasthan, India
Mob.: +91-9772230061 | E-mail :aicplndia@gmail.com | http:/www.aicplindia.com

About

MASS



Founded in 1967, Precision Industries (now **Precision Mass Products Pvt. Ltd.**) is one of the most recognized manufacturer of **wide range of Pressure & Temperature measurement instruments** in India, more renownedly known by its brand "MASS". Mass has established this reputed brand image by offering highly durable, robust and proven products to premium customers in various industrial sectors.

In 1996, we became the distributor for Ashcroft products in India. Year 2008 saw a leap forward in this relation when Precision Mass entered into a joint venture with Ashcroft and established Ashcroft India Pvt. Ltd. In September 2015 this venture happily parted ways and Precision Mass took over the Ashcroft India operations to continue independently.

Our Sales Headquarters and Production plant located at Chhatral (Gujarat) occupies 120,000 square feet, this ISO 9001-2008 certified facility is a self-contained, vertically integrated operation complete with production, projects, design & development, customer service, sales & marketing resource management.

Our commitment towards customer satisfaction has encouraged us to implement best manufacturing practices like "Lean Six Sigma" which enables us to reduce the Lead time, optimize resources utilization to reduce operational cost and continually improving our Process and Product Quality.

With in-depth expertise earned over the years and well equipped production facility, we manufacture Pressure measuring instruments ranging from as low as 10" H2O up till 4000 bar and temperature instruments from -200°C up to 1200°C.

Our team consists of technical and service experts equipped to resolve even the most difficult application and technical issues. We are proficient in providing you with customized solutions for pressure and temperature measurement.

HEAD OFFICES

Precision Mass Products Pvt. Ltd.
Plot No. 2306, G.I.D.C. Chhatral, Ta. Kalol,
Dist. Gandhinagar, Chhatral-382729, Gujarat, India.

(O) +91 2764 233681/2/3
(F) +91 2764 233440
(E) sales@precisionmass.com

ASHCROFT HEISE NAGANO THERMO ELECTRIC

PANAM®

Instrumentation Fittings & Valves

Products we serve

DBB Valves
Max. Working Pressure
upto 10,000 psig (689 barg)

HP Fittings
Max. Working Pressure
upto 60,000 psig (4,137 barg)

Tube & Pipe Fittings, 37° Flare Fittings
Max. Working Pressure
upto 10,000 psig (689 barg)

Valve Mainfolds, & Pressure Regulators
Max. Working Pressure
upto 10,000 psig (689 barg)

Needle Valves, Ball Valves, Check Valves, Relief Valves, etc..
Max. Working Pressure
upto 10,000 psig (689 barg)

Visit us at:- www.panam.in
www.panamengineers.com

PANAM ENGINEERS LTD.
An ISO/TS 29001 Company
203, Jaisingh Business Center, Parsiwada, Sahar Road, Andheri (East),
Mumbai - 400 099. INDIA • Tel.: +91 22 2831 5555 / 57 / 58 • Fax: +91 22 2831 5574.
Email: sales@panamengineers.com • Website: www.panam.in / www.panamengineers.com

TEMPSENS

Thermal & Cable Solutions

- World Class Facilities
- Exporting World-Wide(More Than 70 Countries)

TempSens

Thermocouples, RTDs & Thermowells

Pyrometer & Cameras

Temperature & Pressure Gauges

TempCab

Instrumentation Signal & Control Cables

Marathon Tempwatt

Industrial Heaters

TempSys

Industrial Furnaces

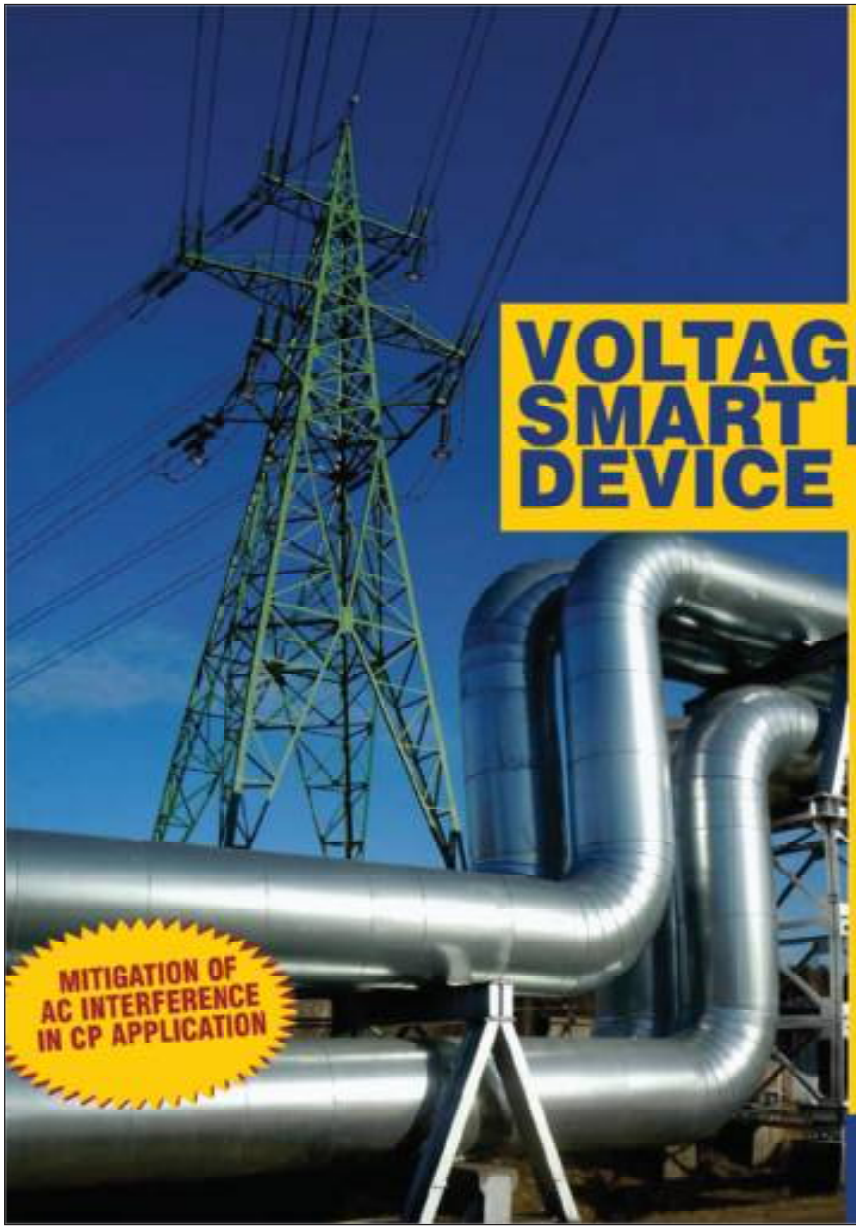
Calibration Equipments

Services

- Fixed Point calibration at TPW (0.01), MPG(29.7646), FPI(231.928), FPZ(419.527), FPA(660.323)
- Calibration of Thermocouples ,RTD and InfraRed Pyrometer from -196°C to 2700°C
- Onsite Calibration from -25°C to 1200°C for Thermocouples ,RTD and InfraRed Pyrometer
- Thermography Survey and Furnace Validation as per AMS-2750

Tempsens Instruments (I) Pvt. Ltd.
B-188A, Road No.5, M.I.A.,
Udaipur - 313003 (Rajasthan) INDIA
Ph. 91-294-3057700, Fax .91-294-3057750
Email: info@tempsens.com
www.tempsens.com

ISO 9001: 2008 Certified Company
ISO 14001: 2004 Certified Company
OHSAS 18001: 2007 Certified Company
Rajiv Gandhi Quality Award Recepient



DEHN

VOLTAGE CONTROLLED SMART DC-DECOUPLING DEVICE FOR PIPELINES

- AC Mitigation with Remote Monitoring of interference level by measuring the AC discharge current
- Single device for long duration, temporary, transient over voltage and Lightning protection
- Long duration current discharging capacity up to 40 A
- Adjustable range as per NACE standard , DC blocking from -7V to +7Vdc
- Disconnection (remote switching ON/OFF) from remote place during ACVG/DCVG survey
- Totally electronic design, No Electrolyte refilling, No maintenance, No human intervention
- Standard IP 65 enclosure (Ex d enclosure on option)

For more Information about DEHN, please visit **www.dehn.in.**
DEHN India Pvt. Ltd.: Plot 213, Sector 7, IMT, Manesar, Gurgaon (Haryana)–122 050.
Tel: +91 124-4007680, **Fax**: +91 124-4007684, **E-mail**: info@dehn.in

DELSEAL

Multi Cable Transit (MCT Blocks)

Modular Cable Sealing System

User Friendly, Local Support

B-28, Sector-18, Gurgaon | Mob : 9910659988
rajesh.sharma@delseal.com | www.delseal.com

VAUTOMAT & INSTRUMENTS PVT. LTD.

F-61, Okhla Industrial Area, Phase-I, New Delhi-110020
Contact : R.K. Bassi (Mob: 9810005826)
Tel: 011-47627200; Email: sales@vautomat.com

RADAR
WIRELESS
LEVEL
FLOW
PNEUMATIC
PRESSURE


RADAR


ULT

WIRELESS


PT


RADAR

Branch Offices at

❖ Mumbai	❖ Kolkata
❖ Chennai	❖ Hyderabad
❖ Vadodara	❖ Jamshedpur

PYRO ELECTRIC®

We sense it the best

Advanced Process Sensing Instruments and Solutions

Temperature Sensors & Thermowells

Reactor Thermocouples

Temperature Sensor assemblies with Transmitter

Skin thermocouples

MI Electric Heat Tracing Cables, Units and Systems

Special purpose MI Electric Heating Cables

MI metal sheathed thermocouple and RTD Cables

Pressure Gauges

Temperature Gauges and Assemblies

Pressure and DP Switches

Disposable Temperature probes (tips)

Sampling Probe

OXT Probe

2 in 1 Probe

Multi Dip Temperature Tip

'X-Flow' Advanced D/P Flow Elements

Differential Pressure Flow Elements

Restriction or Pressure Reducing Devices

Tank Safety Equipments

Magnetic Level Gauges

Glass Level Gauge (reflex/ transparent)

Bicolor Level Gauges

Sight flow indicators

Eye-Hye SmartLevel Remote Level Indication System

PYRO ELECTRIC CABLES & SENSORS

KAMSO PYRO ELECTRIC

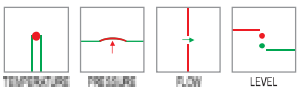
HYDROPNEUMATICS Flow Elements & Tank Safety Equipment

THERMOSTATIC INSTRUMENTS

HNL INSTRUMENTS & CONTROLS

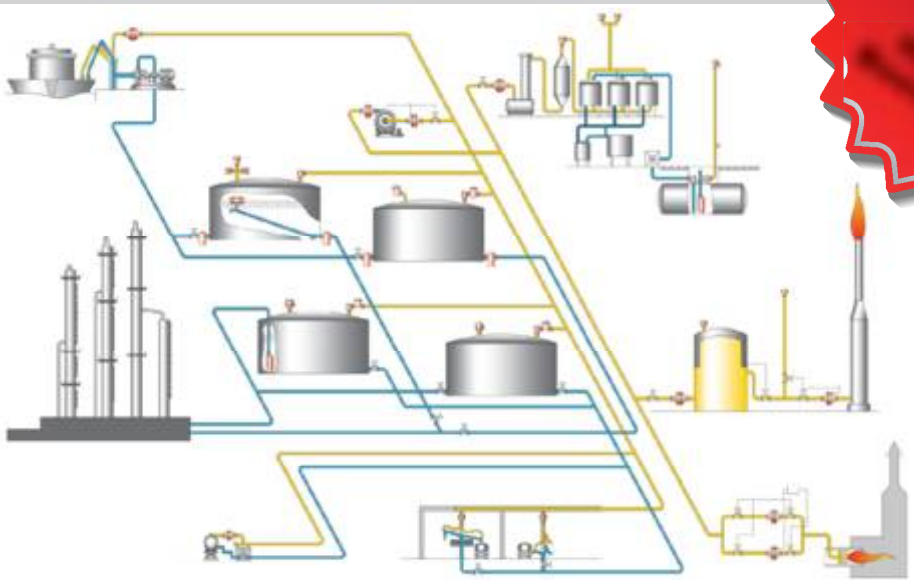
PYRO Clark·Reliance

Ex



CE

Plant Protection



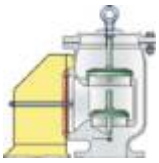
PPA-2017

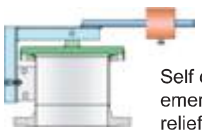
12 Daughter Companies:
Austria, Brasil, China, France, Hungary, India, Middle East, Russia, Spain, Switzerland, UK, USA

120 Sales & Service Partners

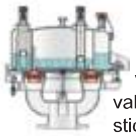
Details at www.protego.com


Combined pressure and vacuum relief valve


Pressure and vacuum relief valve (deflagration proof)

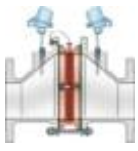

Self closing emergency relief valve


Steam jacketed vent for solidifying vapors


Pressure and vacuum diaphragm valve for polymerizing/ sticky vapor service


Detonation flame arrester


Bidirectional detonation flame arrester


Deflagration flame arrester with an eccentric housing design

PROTEGO India Pvt. Ltd.
R-665, TTC. Industrial Area MIDC,
Rabale
400701 Navi Mumbai, India

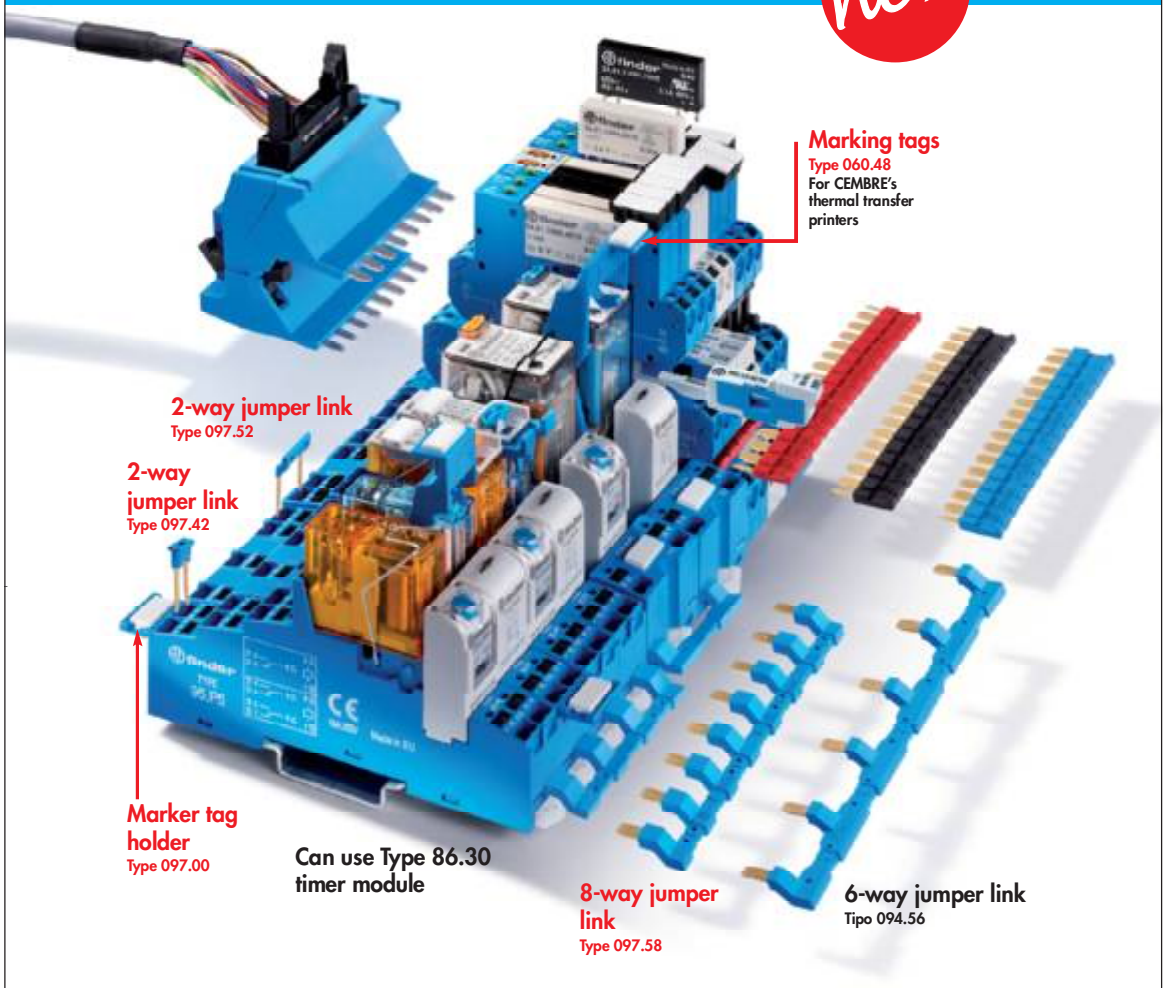
phone: +91 (0) 22 / 27 69 11 56
fax: +91 (0) 22 / 27 69 20 85
email: protegoindia@protego.com

PROTEGO

for safety and environment

MasterIN

new



Marking tags
Type 060.48
For CEMBRE's thermal transfer printers

2-way jumper link
Type 097.52

2-way jumper link
Type 097.42

Marker tag holder
Type 097.00

Can use Type 86.30 timer module

8-way jumper link
Type 097.58

6-way jumper link
Tipo 094.56

MasterIN
New sockets with Push-in technology

Spring terminal for faster wiring and better clamping performance under movement and vibration.

finder®
SWITCH TO THE FUTURE

FINDER INDIA PVT. LTD.
Unit No.902 - R.G. Trade Tower,
Netaji Subhash Place,
Wazirpur District Centre,
Pitampura - Delhi - 110034 - India
Tel. +91-11-47564343
Fax +91-11-47564344
finder.in@findernet.com

www.findernet.com

"With us, monitor the Air that you Breathe"

Environnement S.A France has been certified ISO 9001 and ISO 14001 and implements the best performance Technologies to Design and produces the most accurate Continuous Monitoring Systems. The Analyzers produced are utilized in Ambient Air Quality Monitoring Networks, Stack Emission/ Process Monitoring Systems, Engine Gas Measurements & Water Quality Monitoring Systems. The Industries using the Systems are Thermal Power Plants, Refineries, Petrochemical Plants, Metallurgy, Cement Plants, Pollution Control Boards, R & D Centres, Thanks to its 200 skilled employees and its strategy of offering State of the Art, Turn-key systems and After Sales Customer Support Services, Environnement S.A has for more than 25 years, continued to benefit from privileged relations with its partners in more than 65 countries & through Subsidiaries in USA (Altech Environment), Italy (Environnement Italia), Germany (Environnement SA Deutschland), India (Environnement SA India Pvt. Ltd.) & China

The future is measured today……

Environnement S.A

Environnement S.A India Pvt Ltd

Passionate about Particulate PCME

France : 111, boulevard Robespierre - 78300 Poissy - FRANCE - Tel. : +33 1 39 22 38 00 - www.environnement-sa.com

India : D-16, 3 & 4, TTC Industrial Area, Turbhe MIDC, Turbhe, Navi Mumbai - 400 705, INDIA, Tel. : +91 22 450 20000, Fax: +91 22 450 20001

Total Solutions in High Precision Source and Measurements

FLUKE®
Calibration

Our range of products includes

High Precision Electrical Source and Measurements

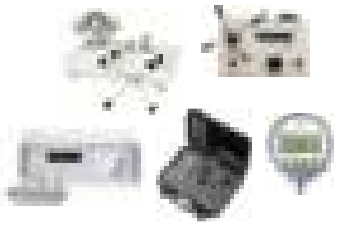
- High Precision Calibrators & Multi-product Calibrators
- Oscilloscope Calibrators
- Metrology Standards, Electrical Power/Energy Standards
- Multifunction Electrical Tester/Calibrator
- Calibration Management Software
- High Accuracy 8.5 digit reference DMM
- Precision 5.5 digit and 6.5digit DMMs
- Data Acquisition Systems
- Special purpose instruments like Nanovoltmeter, Electrometer, Picoammeter and precision current Sources.

High Precision Temperature Measurements and Sources

- Sensors (SPRT, PRT, Thermocouples for Primary, Secondary and Industry Standards)
- Fixed point Cells, Baths, Metrology Wells, Dry Blocks, TPW Maintenance Bath
- Temperature readouts
- Thermocouple Furnace
- IR Calibrators

High Precision Pressure / Flow Measurements and Sources

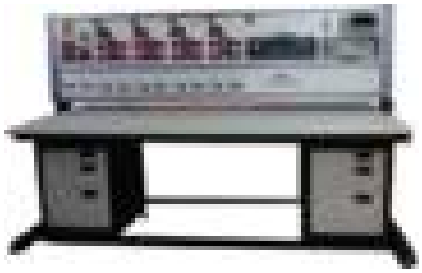
- Automated Pressure Controller / Calibrator
- Primary Pressure Standards, Piston Gauges
- Hydraulic and Pneumatic Dead Weight Testers
- Pressure Comparators
- Gas Flow Calibration Systems
- Electronic Dead weight tester
- Digital Master pressure gauge



Integrated Calibration Solutions

Simplify and Speed up your Calibration with Automated Test Benches

- Handles complex workload with ease
- Broad functionality for Temperature, Pressure, Electrical, RF and Flow calibration
- Faster turnaround time for calibration
- Better calibration consistency
- Standard schematic design and arrangement
- High quality calibration at lower cost
- Minimization of human error
- High workload throughput
- Customized report generation
- Automated calibration software



Fluke Calibration. *Precision, performance, confidence.™*

Fluke Authorized Distributor

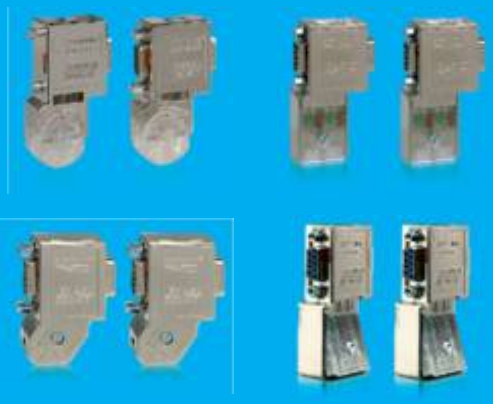
TOTAL SOLUTIONS
C - 923, 1st Floor, Palam Extension, Near Ramphal Chowk, Sector - 7, Dwarka, New Delhi - 110 075
Tel : 011 25071382, 6563 9669 | Fax : 011 2507 1382.
Email : totalsolutionsco@yahoo.co.in

SOFTLINK

IDEABOX

Integrated Architecture Controller

Distributed Fieldbus I/O



Fieldbus Connector

SOFTLINK 300 PLC

CONGMAX ELECTRO

UNIT NO.201, RG Tower
Netaji Subhash Place
Delhi-110034

email: info@congmax.co.in
www.softlink.cn

PROFIBUS PROFINET CANopen EtherCAT Modbus

Gamma Detectors SENSseries LB 480

Non-contacting Long-time Stable Highly Reliable

Oil & Gas Applications

- High Level / Low Level Alarm
- Oil / Water Interface
- Sand Level
- Density of Fracking Fluid
- Density of Separator Outlet Flow

BERTHOLD TECHNOLOGIES

BERTHOLD TECHNOLOGIES GmbH & Co. KG • P.O. Box 100 163 • 75312 Bad Wildbad, Germany
Phone +49 7081-177-0 • Fax +49 7081-177-100 • info@Berthold.com • www.Berthold.com

TIPL 50 Since 1959

Avazonic STAY ASSURED

YOUR SECURITY IS OUR BUSINESS

CCTV Camera

Fire Detection

Access Control

PA/GA Systems

Toshniwal Industries Pvt. Ltd.

Serving Indian Industry since 1959

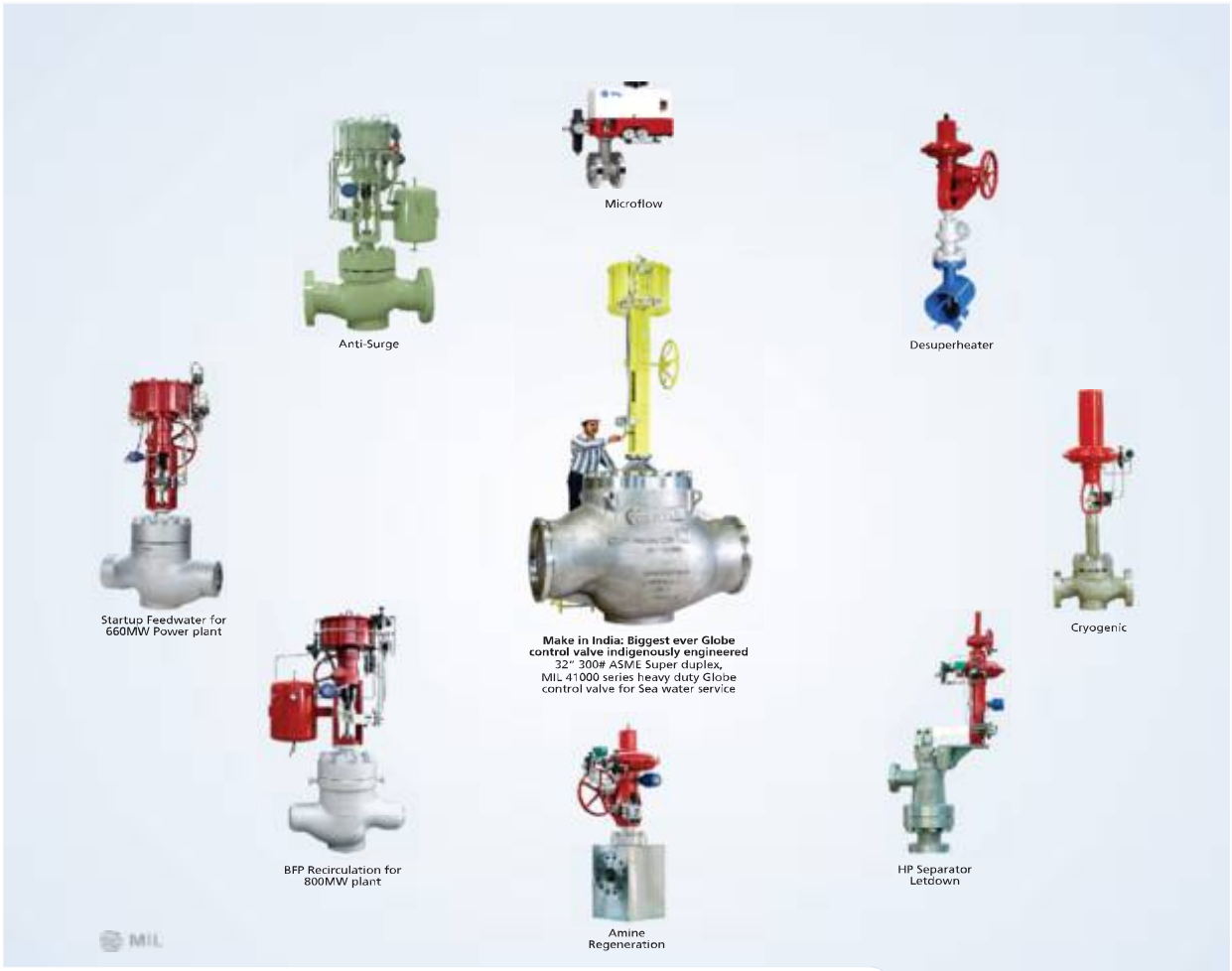
Your Process Partner For

◆ Temperature ◆ Pressure ◆ Level ◆ Flow ◆ CEMS, Gas & Dust ◆
◆ Condition Monitoring ◆ Surveillance & Fire Detection ◆

Ajmer | Ahmedabad | Bengaluru | Bhilai | Chennai | Delhi | Hyderabad | Indore | Jamshedpur | Jaipur
Kolkata | Lucknow | Mumbai | Nagpur | Nashik | Pune | Raipur | Vadodara | Visakhapatnam

T: +91 145 6601111 | F: +91 145 2695174

www.tipl.com info@tipl.com



Wide range. Diverse applications.

Catering to requirements in Process industry with Globe & Angle control valves (from ½" to 36" size and ratings up to ASME Class 4500)

KSB MIL Controls Limited · Regd. Office & Works: Meladoor, Annamanada, **PIN** 680741, Thrissur Dist., Kerala, India.
Tel: +91 480 2695700, Fax: +91 480 2890952, Email: sales.mil@ksb.com, Web: www.ksb-mil.com
Sales Offices: Chennai · Kolkata · Mumbai · Noida · Vadodara · Pune

Our technology. Your success.
Pumps • Valves • Service

KSB

NOCLE SYSTEMS AND CONTROLS PVT LTD
(Formly Elcon Systems Pvt Ltd)

PRODUCT RANGE & FOCUSED SEGMENTS

PRODUCT RANGE

- PLC, DCS & SCADA
- Safety PLC
- Drives & Softstarter
- Power Supply, Relay, Timers, Counters, Push-Button
- Temperature Controller, Sensor & Instruments
- Control Panels
- Online UPS Solution

FOCUSED SEGMENTS

- Water & Waste Water
- Thermal & Solar Power
- Cement
- Transportation (MetroeRailway)
- Automotive and Auto Component Manufacturing
- Metal Industries - Steel & Aluminum
- Fertilizer
- Food and Beverage
- Oil & Gas

SOLUTIONS

- Integrated Architecture Control System
- Plant Wide Process Automation (DCS) System
- PLC Systems
- Variable Frequency Drives
- SCADA System
- Turnkey Solution & MNC project

SERVICES

- Front End Engineering & Design
- Onsite Commissioning support
- Onsite Troubleshooting support
- AMC

DOMAIN eXPERTISE

Water & Waste Water

read more →

Thermal & Solar Power

read more →

Cement / Mining

read more →

Transportation

read more →

Automotive

read more →

Metal

read more →

Food & Beverage

read more →

Oil & Gas

read more →

REGISTERED OFFICE

D-1/286,NEW KONDLI
DELHI-110.096

CORPORATE OFFICE

C-249, SECTOR-63, NOIDA-201301
UTTAR PRADESH, INDIA
PHONE:+91-120-4278 580
E-MAIL: ENQUIRY@NOCLESYS.COM
E-MAIL: SALES@NOCLESYS.COM

BRANCH OFFICE

117/110, N MARKET, KAKADEV
OPPOSITE DEVKI CENEMA, KANPUR, U.P
UTTAR PRADESH, INDIA
E-MAIL: ENQUIRY@NOCLESYS.COM

Delta DLP® Video walls

at National Transmission Asset Management Centre (NTAMC),
Manesar, India

W: www.deltadisplays.com E: vw.sales@deltadisplays.com

DELTA

Automation

(An ISO 9001:2008 Company)
Providing World-Class Technologies & Solutions

SIEMENS

EATON

ABOUT US

M/S Wissen Automation India Pvt. Ltd. is a private limited company promoted by well-qualified and experienced engineering professionals with years of experience in the field of INDUSTRIAL AUTOMATION SOLUTIONS in association with M/S SIEMENS LTD. WAIPL is guided by the philosophy to provide innovative solutions that follow best manufacturing practices to deliver quality and reliability.

CNC Controller

Siemens Logo

Programmable Logic Controller

Variable Frequency Drive

Corporate Office: E-176, Sector – 63, Noida – 201307 (U.P.) india
Website: www.wissenautomation.com

Regd. Offices: B-994, gharoli dairy farm
Mayur Vihar- III, Delhi - 110096

ISA Delhi Section

ISA Delhi Section

Program Details

Date-21st-22nd April-2017

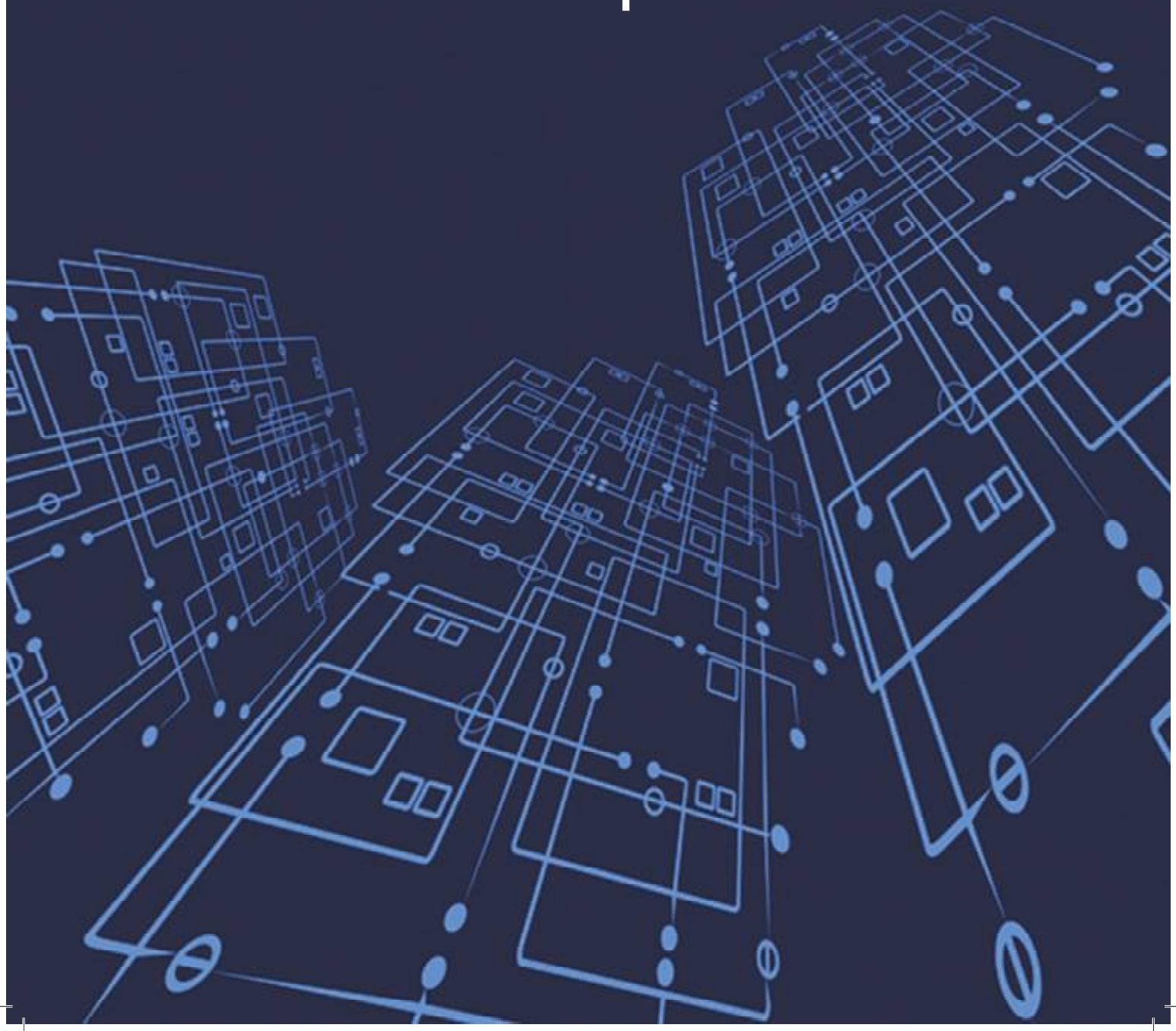
"Hotel Eros, Nehru Place, New Delhi"

DAY-1	21-Apr-17		Pg no.
Inauguration Session	Time		
Registration	08:30 AM	09:30 AM	
Arrival of Chief Guest	09:30 AM	9:45 AM	
Welcome of Dignitaries	09:45 AM		
Lamp Lighting	09:50 AM		
Welcome address by ISA-D President	09:55 AM		
Address by Guest of Honour	10:00 AM		
Address by Guest of Honour	10:15 AM		
Address by Guest of Honour	10:30 AM		
Address by Chief Guest	10:45 AM		
Release of Souvenir by Chief Guest	11:05 AM		
Vote of Thanks by Convener	11:10 AM		
Inauguration of Exhibition by Chief Guest and Dignitaries	11:15 AM		
Networkig Tea Break	11:30 AM	12:00 PM	
Session-1 :	**12:00 PM**	**01:00PM**	
Process and Operation expectations from Automation			
	EIL	Ms. Jayati Ghosh	
	NTPC	Mr. Sudip Nag	
	IOCL	Mr. Sanjay Raizada	
Networking Lunch Break	01:00 PM	02:00 PM	
Session-2	**02:00 PM**	**03:30 PM**	
Deploying automation solutions for effective operation and energy management			
1. Li-Fi Instrument Communication Network	Fluor Daniel India Pvt. Ltd	Mr. Sheikh Rafik Manihar Ahmed	3
2. Unified HMIPIS	NTPC	Mr. Somenath Kundu	107
3. Technical Presentation on Comprehensive Lightning protection solution" as per the recently release NBC – 2016 (National Building Code)	DEHN INDIA (P) Limited	Mr. Brijesh Malik	13

4. New Ways of Sampling System Efficiencies in Power Plants	Forbes Marshal	Mr. Mukesh Vyas	17
Smart Quiz with Special Prizes			
Networking Tea Break	**03:30 PM**	**04:00 PM**	
Session-3	**04:00 PM**	**06:00 PM**	
Workshop & Hands on – Control valve and Analyser system			
Workshop	04:00 PM	05:00 PM	
Control Valve for Severe Service	CCI VALVES	Mr. Tarak Chhaya Mr. Pavitran Kottarathil	35
Physical display of Valve Internals			
Control Valve functioning			
Practical issues faced in valve operation and its solution.			
Case Study			
Workshop	05:00 PM	06:00 PM	
Analyser (Measurement in SRU)	AMETEK	Mr. Jochen Geiger Mr. Ananth Kukkuvada	37
Safety feature in desingining of Anlayser for Hardeous area and Selection			39
Sample handling			
Displaying of Analyser Probe -ASR Probe / HAG Probe			
Analyser Installation : Problem/Issues			
TIME TO VISIT EXHIBITIONS	**06:00 PM**	**07:30 PM**	
Networking Dinner	**07:30 PM**	**10:00 PM**	
Day-2	**22-Apr-17**		
Session-4	**09:30 AM**	**11:00 AM**	
Cutting edge automation for Environment Management			
1. Critical Steps Towards Healthy Environment Emission and Immission Monitoring	Chemtrols Industires Pvt. Ltd.	Mr. Pankaj Kumar Rai	42
2. Process Mass Spectrometry	Spectrum Automation & Controls	Mr. Brijesh Chowdhary Mr. Mukesh Arora	75
3. Problems when measuring TOC-COD with UV Light	HACH	Mr. G. B. Diwakar	119
4. Non-invasive Ultrasonic high temp flow and concentration solutions.	FLEXIM Instruments Asia Pte Ltd	Mr. Lalit Mohan	133
5. Predictive Emission Monitoring System (PEMS)	EIL	Mr. Sourav Mukherjee	167
Smart Quiz with Special Prizes			
Networking Tea Break	**11:00 AM**	**11:45 AM**	

Session-5		**11:45 AM**	**01:30 PM**	
Futuristic Automation and Standard & Practices				
1	Industry 4 as Futuristic Automation	Holdor Topsoe	Mr. Atanu Ghoshal Mr. Vidhya Ratna Pal	177
2	Designing THERMOWELLS in Accordance with ASME PTC 19.3 TW-2016	BECHTEL	Mr. Vikas Lodhi	181
3	Secuirty in COTS	NPCIL	Mr. Neeraj Agrawal	187
4	"Electricity Generation by Bicycle And Its Use In Villages To Overcome Health Diseases"	ISA Student Section	Mr. Abhishek Matlotia Mr. Ajay Kumar	209
Smart Quiz with Special Prizes				
Networking Lunch Break		**01:30 PM**	**02:30 PM**	
Session-6		**02:30 PM**	**04:30 PM**	
Workshop & Hands on – Valves and Level measurement				
	Workshop	02:30 PM	03:30 PM	
	On-Off Valves	Advance Valves		217
	Type Valves for Control Application			
	Relative features of different type of Control Valves			
	Use of Triple Offset Butterfly Valves for Control Application			
	Sizing & Selection of Valves for Control application			
	Case Studies			
	Demostration of Live Model			
	Advance Valves Corporate Presentation			
	Workshop	03:30 PM	04:30 PM	
	Level Measurement	EIP Enviro Level Controls Pvt. Ltd.	Mr. Abhishek Goyal Mr. Rajat Goyal	219
	Solid & Liquid level measurement : Different types & Selection techiques			
	Different Technologies/Types & their calibration.			
	Troubleshooting steps			
	Display & Handson on : Radar ,Ultrasonic, Level Switches etc.			
Panel discussion				
		04:30 PM	05:30 PM	
		End User		
		Automation System Suppliers		
		Consultant		
Felicitations Ceremony		05:30 PM	06:00 PM	
Networking Tea Break and END of the PPAM 2017		06:00 PM	06:30 PM	

Technical Papers



“Li-Fi Instrument Communication Network”

Sheikh Rafik Manihar Ahmed
Control Systems Engineer and Innovation Catalyst
Fluor Daniel India Pvt. Ltd., New Delhi, India.

Abstract: - This paper explains an idea for implementation of Light Fidelity (Li-Fi) on Modular projects (such as Oil & Gas, chemicals, petrochemicals, power plants and other processing industries). In particular, it shows how the application of Li-Fi on Modular projects avoids all the instrument wiring systems and Wi-Fi (Wireless Fidelity) based wireless instrument problems and reduces the life cycle cost of instrumentation system. The implementation of optical wireless instrument communication systems on Modular projects should result in enhanced wireless capacity to realize Industrial Internet of Things (I^2oT) and contribute to the key performance indicators for the Next Generation Plant Communication Network. The availability of Li-Fi communication system provides multiple benefits over wired and Wi-Fi based wireless instrumentation systems. The paper covers all the key areas of engineering, design and construction/fabrication, while implementing Li-Fi on modularization projects to achieve the plants’ requirement in an optimized way.

Keywords: *Light Fidelity; Modularization; Life cycle cost; wireless instruments; Instrument Wiring System; Visible Light Communication; Smart Plant Instrumentation; Wireless Fidelity; Industrial Internet of Things; Cable infrastructure; optical Access Point, Fiber Optic Cable; Ethernet Cable.*

I. INTRODUCTION

As the price of Oil & Gas is dropping, Oil & Gas companies and operators are increasingly looking for the new ways to make their existing traditional processes more efficient & reliable and reduce the fixed costs to preserve margins. In general, Instrument wiring system and cable infrastructures including cables, junction boxes, conduits, termination racks, cabinets, marshalling panels, enclosures, cable tray, conduits, tray support system and MCT’s (Multiple Cable Transit) contribute major portion in the total capital expenditure of the plant instrumentation cost. The implementation of Light Fidelity (Li-Fi) on Oil & Gas, chemicals, petrochemicals, power plants and other processing industries solves the challenges related to instrument wiring system/cable infrastructure and reduce the capital expenditure of instrumentation systems. Li-Fi should not only avoid the challenges related to physical wiring infrastructure but also enhance the optical wireless capacity to realize Industrial Internet of Things (I^2oT). The world is undergoing a dramatic transformation, rapidly transitioning from isolated system to ubiquitous internet enabled things capable of generating data that can be analyzed to extract valuable information. Li-Fi communication system offers advanced connectivity between field devices, systems and services and goes beyond basic machine to machine (M2M) communication.

II. BACKGROUND

A. What is Li-Fi?

Light Fidelity [1] (Li-Fi) is a high-speed, bidirectional, multiple accessible, and fully networked, secured optical wireless communication technology. It is a form of visible light communication (VLC) and subset of optical wireless communication technologies. It uses light instead of radio waves to transmit data streams, which is a part of electromagnetic visible light spectrum.

B. How it Works?

Light Fidelity (Li-Fi) typically implemented Light emitting diodes (LED) bulb at the downlink transmitters and photo-detectors at the uplinks receivers. It takes the advantages of LED which can be pulsed at very high speeds without noticeable effects on the output intensity and human eyes. It consist of

B.1. Transmitter: LED can be used as transmitter to transmit a train of digitally encoded non-coherent signals embedded in its beam by varying current at ultra-high speed as shown in figure.1.

B.2. *Receiver:* Photo-detector detects the tiny changes in amplitude and intensity modulation of receiving beams and then converts into electrical signals. This is then converted back into a data stream and transmitted to a system or device as shown in figure.1.

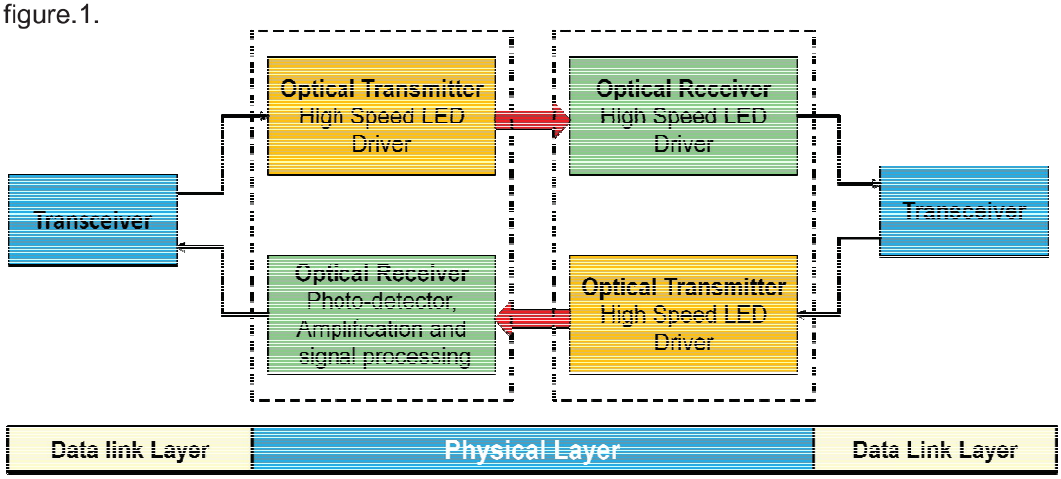


Figure.1: Basic block diagram of full duplex of Transceiver System.

III. The Li-Fi Instrument Communication Network.

The Li-Fi instrument communication network consists of Optical Wireless Field Instruments, Optical Access Point (OAP)/Transceiver Module, Fiber Optics (FO)/Ethernet Media Converter Module installed in the field and/or Module, while multiple control network switches installed in communication cabinet and DCS system in the control room/substation.

→ ***Optical Wireless Instruments*** (OWI) shall be located either inside or outside of the module as shown in figure.3 in the process area of plants. These OWI are used to measure/control the process variable of the plants.

→ **Optical Access Point** (OAP)/Transceivers Module as shown in figure.2 shall be deployed inside the closed module in the form of ceiling and either in the outside handrill platform or in the structure platform/grating/support for the outside of the module and/or open module. OAP connected to FO/Ethernet media converter via redundant Ethernet cable (copper, twist pair, CAT5, RJ45, 8P8C) to convert FO media into Ethernet and vice-versa.

→ **Fiber Optics (FO)/Ethernet Media Converter** Module as shown in figure.2 shall be located in the field and/or module to facilitate the media conversion between fiber optics and Ethernet.

→ **Fiber Optic Cables,** a redundant FO cable as shown in figure.2 routed in separate divergent routes to connect the field installed OAP and control network switches installed in ICS communication cabinet.

→ **Communication Cabinet and DCS Systems** as shown in figure.2 located in the control room/substation. A redundant Ethernet cable connects ICS communication cabinet and DCS/PLC systems located in LCR/LER/SUB.

1. **Optical Wireless Field Instruments: -**

   i. *Optical wireless transmitter*, as shown in figure.2 constituted by a sensor for real time measurement of process variable information and its timely transmission per update rate of OWI to the OAP via optical signal.

   ii. *Optical Wireless Control Element*, as shown in figure.2 constituted by the control element and the light sensitive module, which receive optical signal at light sensitive sensor and convert into respective electrical signal to control the process variable.

2. **Optical Access Point (OAP) /Transceivers Module: -** It comprises a LED lights, light sensitive sensor (photo-detector, solar panels etc.), high speed LED driver, Amplification & Processing Module, OAP/Transceivers Power Module. Light sensitive sensor is connected to optical receiver, Signal processing & amplification module. Signal processing & amplification module processed the process variable information transmitted from the optical wireless transmitters and sent to the DCS/PLC systems located in LCR/LER/SUB via redundant FO cable. Switch control module converts the control signal form DCS/PLC systems into a switching signal of a specific frequency. High speed LED driver receives the switch signal, which is converted to the LED flashing lights (Optical Signal). Intrinsically safe battery packs or replenishes energy (such as thermal, Solar, Vibration & wind solution) responsible for light sensitivity sensor module, LEDs array, processing module power supply.

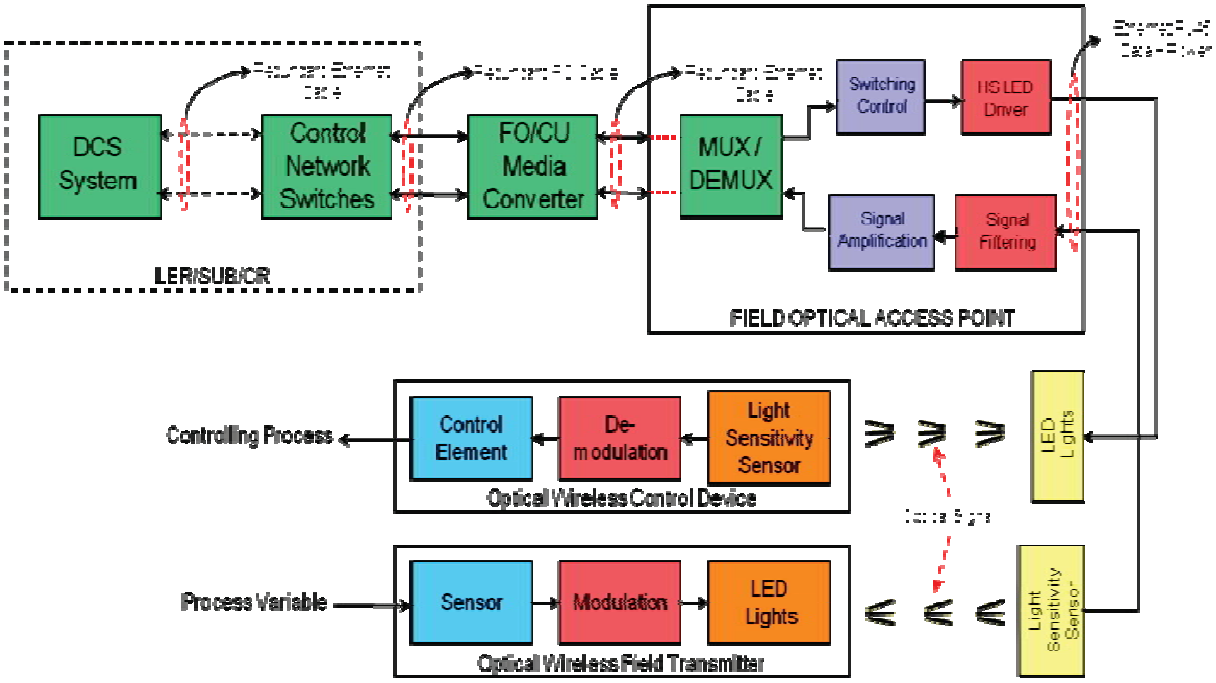
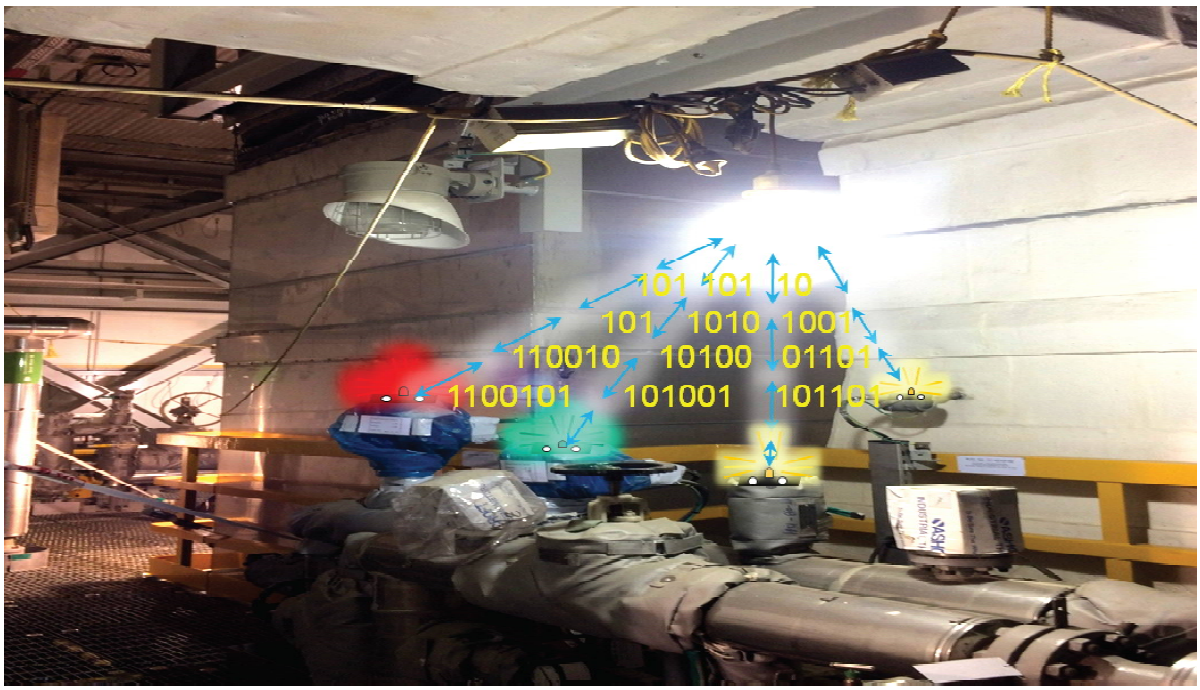


Figure.2: Block diagram of Li-Fi instrument communication network.



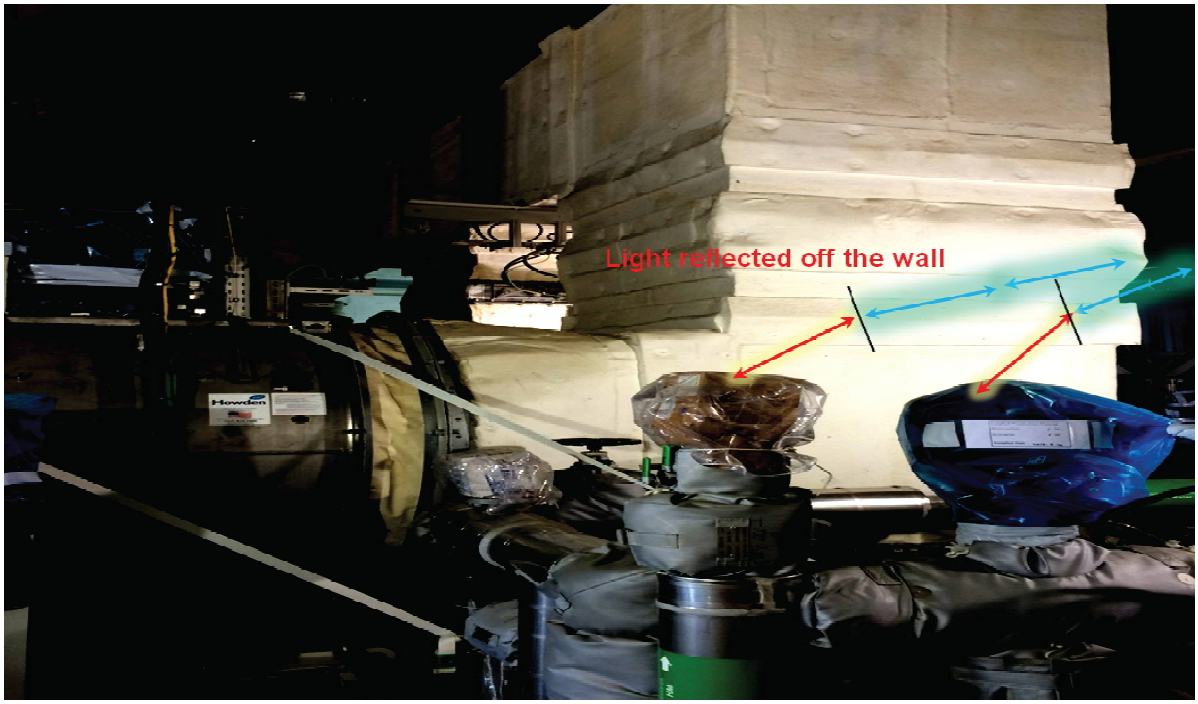


Figure.3: Data transmission between optical wireless field instruments (OWI) and OAP.

Figure.4: Data transmission between optical wireless field instruments (OWI) and OAP.

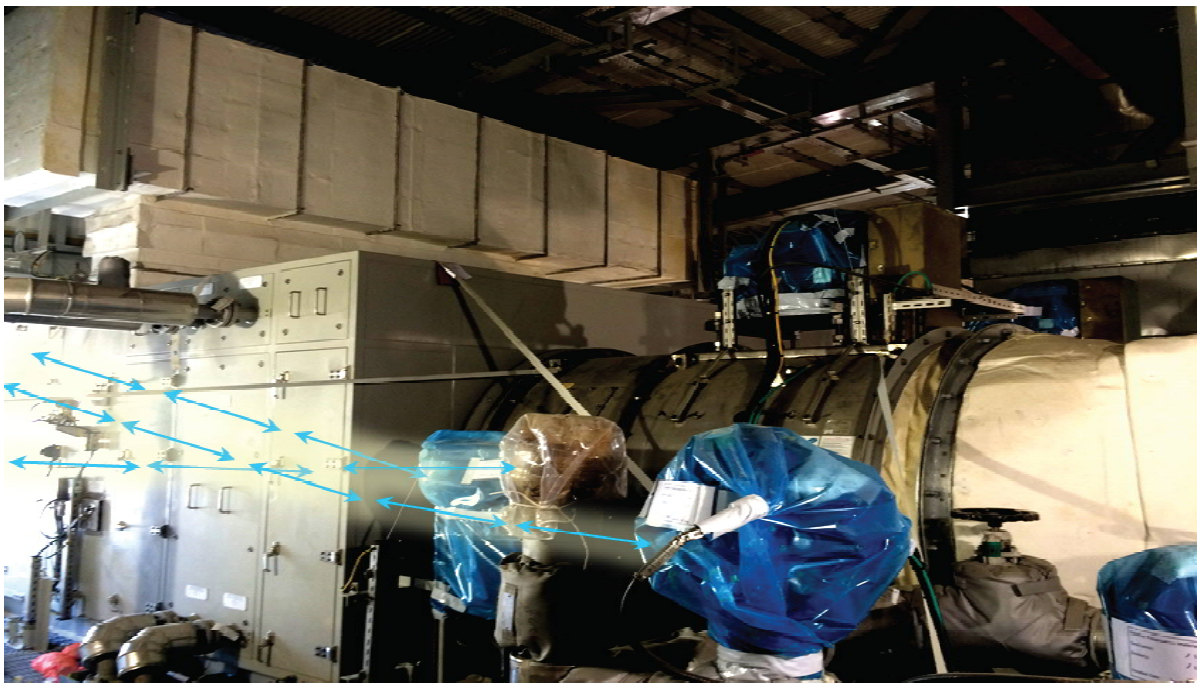


Figure.5: Data transmission between optical wireless field instruments (OWI) and OAP.

IV. Detailed Design Specification

The effective range of an optical wireless instruments are based on the linear distance between the optical wireless instruments (OWI) and optical access points (OAP), when in the presence of the process infrastructure inside the module. Typically, if the optical wireless instruments and optical access point have no obstacle between them, and have direct line of sight (LOS), and optical wireless instruments are mounted in the effective lumens area of OAP, then the data transfer between OWI & OAP will be very high.

The effective range of an OWI and OAP are also depending upon the illuminance of the LED lights. If the OAP and OWI constituted of low illuminance LED Lights, then the effective range between them will be less (i.e. minimum 3m in direct Line of Sight). Similarly, if the OAP and OWI constituted by medium and/or high illuminance and guided (Such as laser) RGB LED lights, then the effective range will be high.

→ Obstacles decrease the effective data transfer rate, if it is not a clear line of sight. The main problem with Li-Fi wireless instrument communication network is that, the optical signal can't go through the objects or doesn't penetrate through the solid objects, so if the either OWI or OAP is by mistake blocked totally in anyway (Either due to design or workmanship ignorance), then the optical signal will instantly cut out or cut off.

→ Most process environments have equipment, pipelines; structural metals that reflect optical signals arranged in a non-predictable manner and reflect the optical light signal off the metal of the surrounding environment. This highly dense environment will not affect the range of OWI and OAP, because direct line of sight is not necessary for OWI and OAP to transmit a signal, the light signal reflected off the metals can achieve 70 Mbps data transfer speed.

The effective range of OWI and OAP in the process environment inside modular projects can be split into three categories as follows:

A. *Highly Dense Environment: -* This is the typical, highly dense plant environment inside the modular structure where there are large number of equipment, instruments, pipelines and structural metal. In this type of environment, object/metals present in the process environment, reflected off the optical signal, which affects the data transfer speed (70 Mbps), but not the range of OWI/OAP.

B. *Medium Dense Environment: -* This is the medium dense process area, where the appropriate space exists between the equipment and structure. In this type of environment, the data transfer rate shall be slightly less than its average high rate.

C. *Light dense Environment: -* This is the light dense environment, where the optical signal gets clear and direct line of sight between OWI and OAP. The data transfer rate shall be more than average high rate.

These values for effective range of OWI and OAP are theoretical guidelines as per study and are subjected to change in future with practical modular and site tests in different types of process environments. The factors that significantly minimize and/or obstruct the optical signal are:

i. Mounting the optical wireless field instruments above the optical access point (OAP). The optical signal doesn't receive by optical access point.
ii. Mounting the OWI outside the closed module. The optical signal may get interfered or obstructed in any way.
iii. Mounting the optical wireless instrument isolated from the network by an Enclosure/heat box/insulated blanket blocks the optical signal to transmit and/or to receive. A small fiberglass device enclosure is appropriate solution for such harsh application or environment, due to its clear, transparent in nature.

V. Li-Fi Optical Access Point Network Design

In Li-Fi wireless instrument communication network, the installation of Optical access point (OAP) affects the optical wireless instruments (OWI) performance, which ultimately reduces the system performance. The closed module of any process area shall have multiple optical access points (OAP) installed. Therefore the optical signal from an adjacent/nearest OAP causes interference, which limits signal to interference plus noise ratio (SINR). It is not possible for OAP/OWI to transmit coherent optical signal, due to the use of LED lights and the information has to be encoded by changing the amplitude of the light (Turning On/Off). In order to avoid interference of optical signal from neighboring OAP and to provide multi-instruments access from the same OAP, the popular frequency reuse concept can be applied. As per frequency reuse concept, the available frequency can be divided and shared among the different OAP [2].

The network models evolved for radio frequency network shall be applied for Li-Fi, due to its uniform signal coverage. Similarly, the design of lighting are decided in home and large office environment to brighten up the whole area in a consistent way [3]. The following different OAP network model has been evaluated as follows:

A. *Hexagon Network Model: -* Conventional hexagon topology is well known and widely used in radio frequency cellular application. This is a standard model, in which OAP are located/installed in a sequential manner to form a grid of identical and Voronoi regular hexagon shaped network.

B. *Square Network Model: -* In square lattice network model, OAP are located /installed in a way to form a grid of identical and square shaped Voronoi cells.

The square network models are best suitable in large area to brighten up the entire space as compared to hexagon network model. However, the inside modular environment typically contains no. of unpremeditated objects such as structural beams, electrical lightning, equipment and pipelines etc. Therefore, it is difficult to examine the performance of such network in reality.

The spatial point processes are useful as statistical model in the analysis of observed patterns of OAP and also provides more accurate solution for network interference model.

C. *PPP (Poisson Point Process) Network Model: -* It is most common and widely used spatial point process model [4], in which the no. of OAP is considered to follow the Poisson distribution and OAP are geographically independent to each other. This model is unrealistic, due to its unpredictable nature [5]. Sometimes two OAPs can be arbitrarily

close to each other. It may represent scattered objects such as transmitters in wireless network.

D. *HCPP (Hard core Point Process):-* The Hard core point process is similar to spatial point process, which includes additional parameter (***c***) that controls the minimum separation between any two OAP in order to overcome the limitation of PPP Model.

i. Hexagon Network Model ⟶ Best performance.
ii. Square Network Model ⟶ Better than HPCC Network Model.
iii. HPCC Network Model ⟶ Better than performance.
iv. PPP Network Model ⟶ Worst Performance.

Increase in Network Performance
Hexagon Network > Square Network > HPCC Network > PPP Network

The study shows the result in which the performance of Li-Fi OAP network can vary significantly [5].

VI. Spare Capacity and Expansion of OWIs in future.

During a typical project, there is often a requirement to provide installed spare hardware (such as marshalling cabinet, I/O cards, space in cable tray, and terminations) and additional spare space. These values could vary between 20 to 30 % depending upon project (project specific). The consideration when designing with optical wireless instrument on Li-Fi instrument communication network will be different. As it has no cabinetry marshalling, I/O cards and termination are required. It will only add OAP in the communication network as per Voronoi network design model to increase the OWIs capacity if required in future.

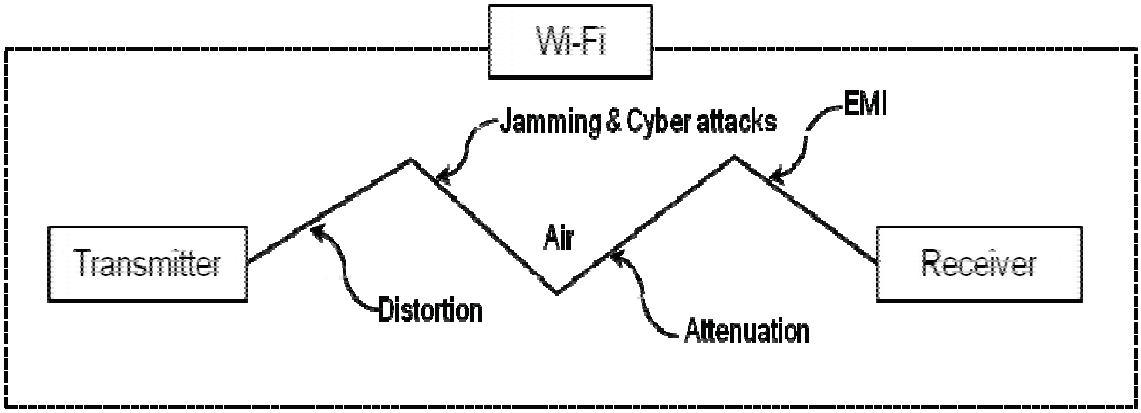
VII. Optical wireless availability and Redundancy

Li-Fi instrument field communication network is inherently redundant between the OWIs and OAPs. The following considerations for maximizing systems performance and better communication network are as follow:

i. Provide accurate and safe grounding to the OAP and OWIs as per standard and Electrical code to avoid unnecessary voltage fluctuation. Because improper grounding may cause network failure.
ii. Provide proper surge protection to OWI and OAP for instrument installed outside module.
iii. Always use redundant power and uninterrupted power supply (UPS) for OAP. This is the main source for OAP failure.
iv. The illuminance for the OWI for the modular field network shall be (LOS) in direct line of sight if measurements are critical.
v. Make OAP connection to ICS communication cabinet (Control Network Switch) redundant. This includes physical communication Ethernet/FO switches, Power supply, FO cables upto DCS systems.

VIII. Signal propagation to the system

A. The wired technology faces the non-process related stresses, which may also impact the measurement quality such as crushed cable, excessive length, poor gladding, mechanical fatigue, cable routing complexity, routing between wiring components, supporting cable



weight, grounding, lightning as shown in figure.6. External noise can cause erroneous reading.

Figure.6: Signal flow in wired instrument communication.

These intermittent and non-process related stress failures can be hard to detect, costlier to fix and lead to poor decision making by craftsmanship/workmanship/operator/Engineer.

B. The Wi-Fi based communication network is also susceptible to environment influence and cyber attacks crime such as signal propagation failure, attenuation, distortion, electromagnetic interference, changing set point by cyber attacks, Network Jamming, and hacking client data & misuse of set point value or process data as shown in figure.7 etc.

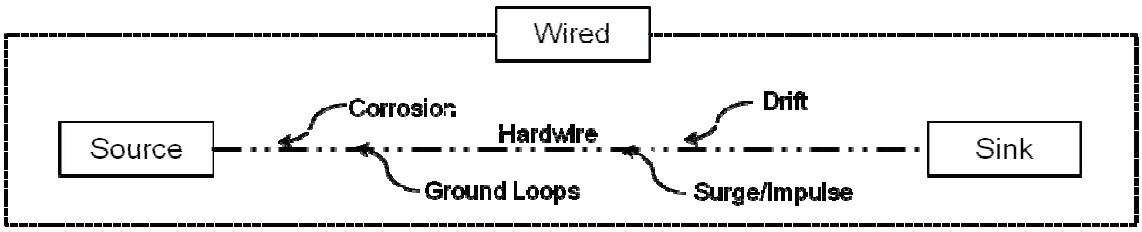


Figure.7: Signal flow in Wi-Fi instrument communication.

Wi-Fi wireless data transfer failed to detect the value changed by the cyber attacker or a hacker in the system side, which may cause distortion, shutdown, downtime and even explosion in the plant.

C. The Li-Fi instrument communication network also faces different types of difficulties in transferring data/media via optical signal, which may also impact the quality of data received

by the OWI/OAP such as interference by other light beam, signal to interference plus Noise ratio (SINR), non-linear signal distortion, low illuminance as shown in figure.8 etc.

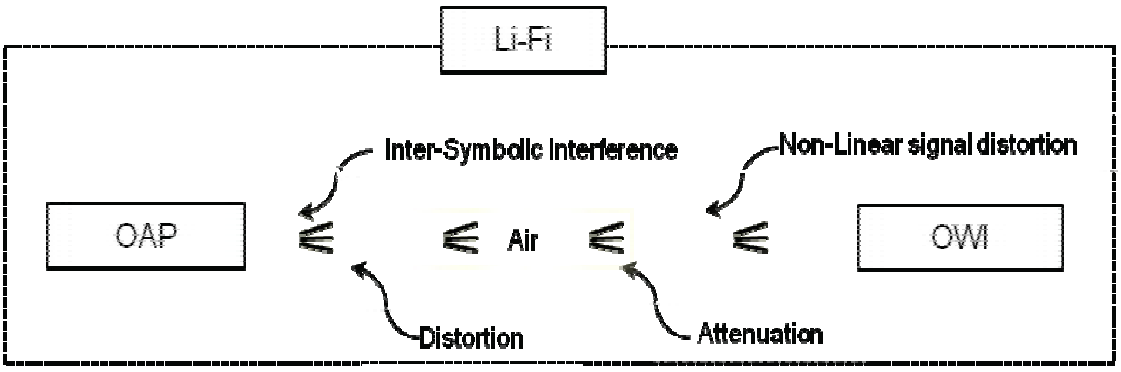


Figure.8: Signal flow in Li-Fi instrument communication.

These problems in Li-Fi instrument communication network are detectable and easily removable. It is very secure, because light doesn't penetrate through walls.

Conclusion: It can be concluded that a Li-Fi Instrument Communication Network should be applicable for both control and monitoring applications due to its high-speed media transfer, scan rates, update/continuous monitoring rate. Li-Fi and its application are expected to continue to evolve for better control and monitoring.

REFERENCES

[1] H. Haas, L. Yin, Y. Wang and C. Chen, "What is Li-Fi?," in *Journal of Light wave Technology*, vol. 34, no. 6, pp. 1533-1544, March15, 15 2016. doi: 10.1109/JLT.2015.2510021.

[2] V. Donald, "Advanced mobile phone service: The cellular concept," *Bell Syst. Tech. J.*, vol. 58, no. 1, pp. 15–41, Jan. 1979.

[3] *Lighting of Indoor Work Places*, European Standard EN 12464-1, Jan.2009.

[4] D. Stoyan, W. S. Kendall, and J. Mecke, *Stochastic Geometry and itsApplications*, 2nd ed. Hoboken, NJ, USA: Wiley, 1995.

[5] F. Xiong, *Digital Modulation Techniques*, 2nd ed. Norwood, MA, USA:Artech House, 2006.