Capacity Building workshop

Fuel shift – Issues, challenges and benefits

22nd February 2018 at Khurja

Under the project
Capacity Building of Local Service Providers (LSPs)

Supported by
GEF-UNIDO-BEE Project
Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India

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Workshop summary

Overview of workshop

Capacity Building workshop of Local Service Providers (LSPs) on Fuel shift – Issues, challenges and benefits was organized by TERI on 22nd February 2018, Thursday in association with Central Glass and Ceramic Research Institute (CGCRI) under GEF-UNIDO project. Total 33 participants were present during the workshop and for the institute/training centre visit, which was organized after the workshop. Agenda of the workshop and list of participants are attached in the annexure 1 and annexure 2 respectively.

Summary of points discussed in the meeting

Dr Lalit Kumar Sharma, Scientist in Charge, CGCRI welcomed the participants and thanked TERI and UNIDO for arranging the capacity building workshop. He reminded the participants and highlighted the need for changing existing tunnel kiln from oil to natural gas based system. He emphasised on the importance of using natural gas being clean fuel for business sustenance as well as to meet the regulatory compulsion to reduce emission from pottery industries. He explained the importance of the training programme on the emerging issue for the Khurja pottery cluster and need for capacity building programme that focuses on gas based tunnel kiln for trouble free and efficient operation. He encouraged all participants to actively take part in the programme and take full advantage of the knowledge sharing programme.

Mr N Vasudevan, TERI gave a brief background of the GEF-UNIDO-BEE project activities in Khurja pottery cluster and also explained the objective of the workshop. He stressed that awareness on best operating practices is equally importance similar to adoption of advance technology to improve overall energy efficiency in any manufacturing process. Therefore, it is essential to upgrade the skill of the service providers on the emerging technology for the cluster. He informed about the current available equipment's at energy cell and how industries can benefit by availing energy audit services at low costs.

Mr. A M Ghosh, TERI gave descriptive presentation on best operating practices in fuel combustion, issues related to system design and specification of equipment to be considered for air and gas train including and piping for their integration. He explained the primary reasons which may affect the operational efficiency of the firing kiln and how to improve using good practices, which eventually results in significant amount of energy savings. He also shared various operational parameters to optimise the performance of existing gas fired tunnel kiln system. He explained about the energy efficient machines though required high capital cost can result in lower running cost over a lifetime due to its efficient operation.

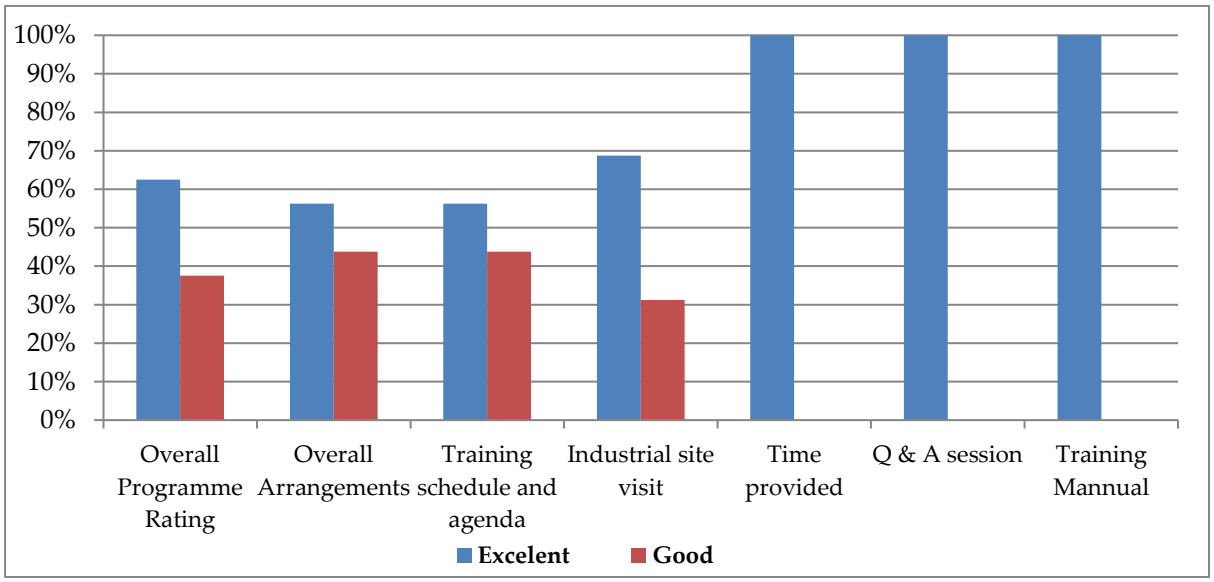
Mr. Vikas Balodi, Honeywell Automation India Ltd gave presentation on the various safety devices, automation option for PLC based automatic operation of gas fired kiln system. He highlighted the issues to be kept in mind while selecting different equipment for gas and air train system in general and piping size and system integration for gas distribution starting from gas skid to different point of combustion. He also expressed the availability in helping interested participants if felt necessary in future for system design and specification finalization.

Mr. Madan Bhati, M/s M B engineers, Khurja has extensive experience in gas train integration with burner including appropriate safety system and also his organization is one of the approved vendors of Adani Gas and involved in undertaking piping work for natural gas distribution within a plant in Khurja pottery cluster. He stressed upon the need of proper piping system design, laying and welding activities in piping to ensure leak proof system. Natural gas being highly inflammable, it is essential to adopt best practices not only in piping system but also install appropriate safety devices such as safety shut off valve for low and high pressure limit at which gas to be supplied to burner.

After the lunch, the participants were taken to common facility centre (CFC), engaged in undertaking job work for different pottery products on payment basis. The plant has an oil based tunnel kiln and interested to switch over to gas fired tunnel kiln with adoption of assorted energy efficient utilities for manufacturing process steps. Participants were shown the process steps and briefed about potential changes can be introduce to reduce energy cost in the process. Site visit was ended with group photo. Selected photos of the workshop and site visit are provided with the annexure 3.

Feedback forms

Based on the analysis of the feedback forms received from the participants, it was observed that workshop was well received by the participants and 100% participants were satisfied with ceramic visit, Q&A session and training module provided to them. About 63% participants have rated overall program as "Excellent" while rest of them have rated it as "Good". More than 56% of participants were satisfied with arrangements made, training schedule and agenda of the program. Few sample feedback forms are attached in the annexure 4.



Analysis of feedback forms

Suggestions by participants

Some participants have made suggestions as follows;

1) Requirement of detailed workshop on gas based tunnel kiln

2) More details on safety issues in gas based operation

Learnings by participants

Some of the topics learned by the participants and mentioned by them are listed below;

1) Use of automation in kilns
2) Application of IE3 motors for different motive loads

Annexures

Annexure 1: Agenda of the program

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Thursday, 22nd February 2018

Conference Hall, CGCRI, Khurja ceramic Cluster

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Agenda

10:00 – 10:30	**Registration**
10:30 – 10:35	**Welcome Address** Dr Lalit Kumar Sharma, Scientist in Charge, Central Glass and Ceramic Research Institute
10:35 – 10:40	**Opening Remarks** Mr N Vasudevan, TERI, New Delhi
10:40 – 10:45	**GEF-UNIDO-BEE project and initiatives in Khurja cluster** Mr Ajeet Singh, UNIDO Cluster Leader - Khurja
10:45 – 11:30	**Impacts of fuel combustion on energy efficiency and opportunities in Khurja cluster** Mr Ananda Mohan Ghosh, TERI
11:30 – 12:15	**Fuel shift (oil to natural gas) in kiln: issues on air and gas train** Mr. Madan Bhati, M/s M B engineers, Khurja
12:15 – 13:00	**Safety issues on gas based system and approved vendors for utilities** **Mr Vikas Balodi**, Honeywell Automation India Ltd., Delhi
13.00 – 13:30	**Q&A**
13:30 – 14:30	Lunch
14:30 – 16:30	**Site Visit / On-site training** Visit to Common Facilities Centre (CFC) of pottery industries, Khurja
16.30 – 17:25	Feedback from participants
17:25 – 17:30	**Vote of thanks** Dr C S Prasad, CGCRI, Khurja

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Annexure 2: List of participants

S.No	Name	Organization	Mobile No	Email ID
1.	Vikas Balodi	Honeywell Automation India Ltd	9560996100	Vikas.balodi@honeywell.com
2.	Hemant Sharma	Ssrtech	8130407771	hemant@ssrtech.in
3.	Piyush Sharma	Technical Consultant, TERI	9412162688	glasscoengg@rediffmail.com
4.	A M Ghosh	TERI	9811836693	amghosh@teri.res.in
5.	N Vasudevan	TERI	9871974187	nvasu@teri.res.in
6.		Anas Engineering works	9837510606	Anasew786@gmail.com
7.			9917713322	
8.	Yadvendra	Bright	8954457757	Gudduyadvendra@gmail.com
9.				
10.	Faizan Saiji	Hi Tech	9927878696	hitechkhurja@gmail.com
11.	Sanjeev M P	Rajeev Pottery	9837054172	Rajeevpottery@yahoo.com
12.	Madan Bhati	M B Engineers	9999957244	Bhati.madan@gmail.com
13.	Anurag Singh	CGCRI	9897373223	Anuragsingh2023@gmail.com
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15.	Akhilesh Kumar	CGCRI	8755118416	Akhilesh.kumar01596@gmail.com
16.	Rajeev Kalra	Kalra Cera Products	9837093975	kalracare@yahoo.com
17.	Rajendra A	Agarwal Tradings	9897592236	
18.	J K Prasad	CGCRI	9411476971	shashikantprasad@gmail.com
19.	Asmat Ullah Khan	Brite Industries	9358891661	
20.	Ravinder Kumar	Rahul Ceramics	9897162915	
21.	Amar Nath Verma	CGCRI	9058608541	Amarpatel289jigr@gmail.com
22.	Virendra Pandit	Patra Ceramics, Khurja	7417176074	akekopromod@gmail.com
23.	B Chand	CGCRI	9897129630	
24.	H Bashir	Goodluck Industries	9219515912	
25.	K M Divya	CGCRI	9758173304	
26.	Darshan C	Slico	9837013160	Jindia25@gmail.com
27.	Sanjeev Bathia	Viswanath Ceramics	9837066242	viswanath@mail.com
28.	Rajkumar	Raj Engineering	9719196175	
29.	C S Prasad	CGCRI	9412227617	
30.	L K Sharma	CGCRI	9412227619	
31.	Ajit Singh	UNIDO	8980371090	
32.	K C Singh	CGCRI	9412227608	
33.	Veerash Sharma	Parashan Pottery	9639010425	

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S. No	Name	Organization	Mobile No	Email ID	Signature
1.	Vikas Baloli	Honeywell Automation India Ltd.	9560386100	Vikas.baloli@honeywell.com	
2.	Hemant Sharma	SSvtech	8130407771	hemant@ssvtech.in	
3.	Jigesh Sharma.	TECHNICAL CONSULTANT TERI,	94121 62688.	glasscoengg@rediffmail.com	
4.	AM GHOSH	TERI	9811836693	amghosh@teri.res.in	
5.	N. VASUDEVAN	TERI	9871974187	nvasu@teri.res.in	
6.	[illegible]	Anad Engineering Works	9837510606	anasew7866@gmail.com	
7.	[illegible]	A-K [illegible]	9997173322	A-K [illegible]	

S. No	Name	Organization	Mobile No	Email ID	Signature
8.	Yadvendra	Bright Industry	8954457757	[illegible]yadvendra.@gmail.com	[signature]
9.	Merajuddeen	Rohinullah ceramics.	9639677133	—	[signature]
10	Faizan Saifi	Hi-Tech	9927878696	HiTechkhurja@gmail.com	[signature]
11	Sanjeev Mittal	Rajeev Pottery	9837054172	rajeevpottery@yahoo.com	Sanjeev Mittal
12	Madan Bhati	M.B Engineers	9999957249	bhati.madan@gmail.com	[signature]
13	Anurag Singh	CGCRI	9897373223	anurag singh2022@gmail.com	Anurag S
14	Dharmendra Singh	CGCRI	9045927626	ds34412@gmail.com	[signature]
15	Akhilesh Kumar	C.G.C.R.I.	8755118416	akhilesh.kumar01[illegible]@gmail.com	
16	RAJEEV KALRA	Kalra Cera Products	9837093975	Kalra Cera@Yahoo.com	[signature]
17	Rajendra Agrawal	Agarwal Trading Co.	9837532236	Modakhra Godaram. G.T Road Khurja	[signature]

S. No	Name	Organization	Mobile No	Email ID	Signature
18	S. K. Prasad	C. G. C. R. I.	9411476971	shashikantprasad6@gmail.com	[signature]
19	Asmat ullah Khan	Borile industries	9358891661		[signature]
20	राहुल सिंह मिश्रा ⇄	रविन्द्र कुमार	9897162715		[signature]
21	Amar Nath Verma	C.G.C.R.I	9058608541	amarpatel[illegible]@gmail.com	[signature]
22	Virendra Pandit	patna ceramics Khurja	7417176074	AKeKo Promod @Gmial	[signature]
23	B. Chand	C.G.C.R.I	9897129630		[signature]
24	H. BASHIR.	Good luck Art	9219515912		[signature]
25	Km-Divya	C.G.C.R.I	9758173304		[signature]
26	Darshan Chand	Silico Ackerman Porcelain	9837013160	jindal25@gmail.com	[signature]
27	SANJEEV BATHLA	VISWANATH CERAMICS	9837066242	VISWANATH@[illegible].com	[signature]

S. No	Name	Organization	Mobile No	Email ID	Signature
28	[illegible]	[illegible]	9719196175		
29	Dr. C.S. Prasad	CSIR-CGCRI, Kc.	9412227617	csprasad.prasad9@gmail.com	
30	Dr L K Sharma	CGCRI	9412227619		
31	Ajit Singh	UNIDO	8980371090		
32	K C Singh	CGCRI	9412223608		
33	Veerath Sharma	Parathan Pottery	9639010425		
34					
35					
36					
37					

Annexure 3: Selected photographs of the event

Annexure 4: Sample feedback forms

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Thursday, 22nd February 2018

Conference Hall, CGCRI, Khurja ceramic Cluster

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Evaluation Sheet for Participants

Feedback Form for Participants			
Parameter	*Feedback*		
	Excellent	Good	Average
How would you rate the overall programme?		✓	
How would you rate overall arrangements?	✓		
How was the training schedule and agenda?		✓	
How was the industrial site visit?	✓		
Do you think that adequate time was provided for each topic?	Yes [✓]	No [ ]	
Do you think that satisfactory answers were given to your questions during the training programme?	Yes [✓]	No [ ]	
Do you think that the background training manual is informative and useful enough?	Yes [✓]	No [ ]	
Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	
Suggestions & Recommendations for improvement:			
overall seminar is informative. Nice to join this			
Name two learning, which from this programme you will be able to implement in your plant?			
No			
Signature: Harsh Chauhan			
Name of participant: HARSH CHAUHAN			
Organization: ELICO MARKETING PVT LTD.			
Mobile No: 9560790114			
Email ID: delhi5@elicomarketing.com			

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Do you think that the discussion on EE/RE will help you in your work?	Yes [ ]	No [ ]	
Suggestions & Recommendations for improvement:			
1- Visit for Best industries time to time 2-			
Name two learning, which from this programme you will be able to implement in your plant?			
suggestion for Gas fuel			
Signature:			
Name of participant:	YADVENDRA Singh		
Organization:	Bright Industries		
Mobile No:	8954457757		
Email ID:			

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Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	
Suggestions & Recommendations for improvement:			
कृपया जानकारी के सैंपल हिंदी में दिया करें।			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature: राज इन्जीनियरिंग 9719196175 RK			
Name of participant:			
Organization:			
Mobile No:			
Email ID:			

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Do you think that the discussion on EE/RE will help you in your work?	Yes [ ]	No [ ]	
Suggestions & Recommendations for improvement:			
प्रोग्राम बहुत अच्छा था इसे होते रहना चाहिए			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature:			
Name of participant:	Rajendra Agrawal		
Organization:			
Mobile No:	9897592236		
Email ID:	rajendraagrawal452@yahoo		

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Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	
Suggestions & Recommendations for improvement:			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature:			
Name of participant:	Sharafat Ali		
Organization:	Anas Engineering Works		
Mobile No:	9837510606 – 8439857805		
Email ID:	anasew786@gmail.com		

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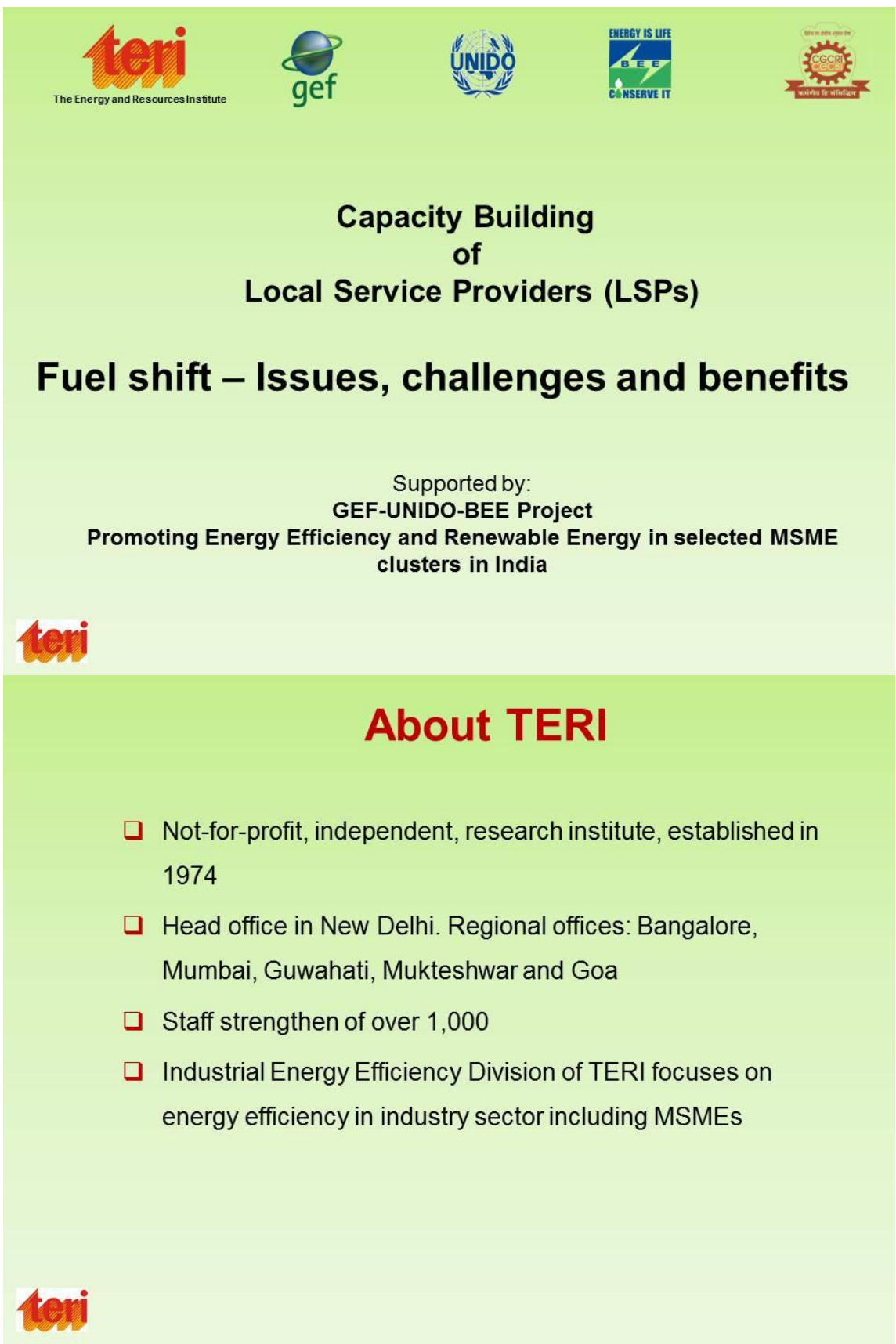
Annexure 5: Copy of presentations



Energy audits - TERI's experience

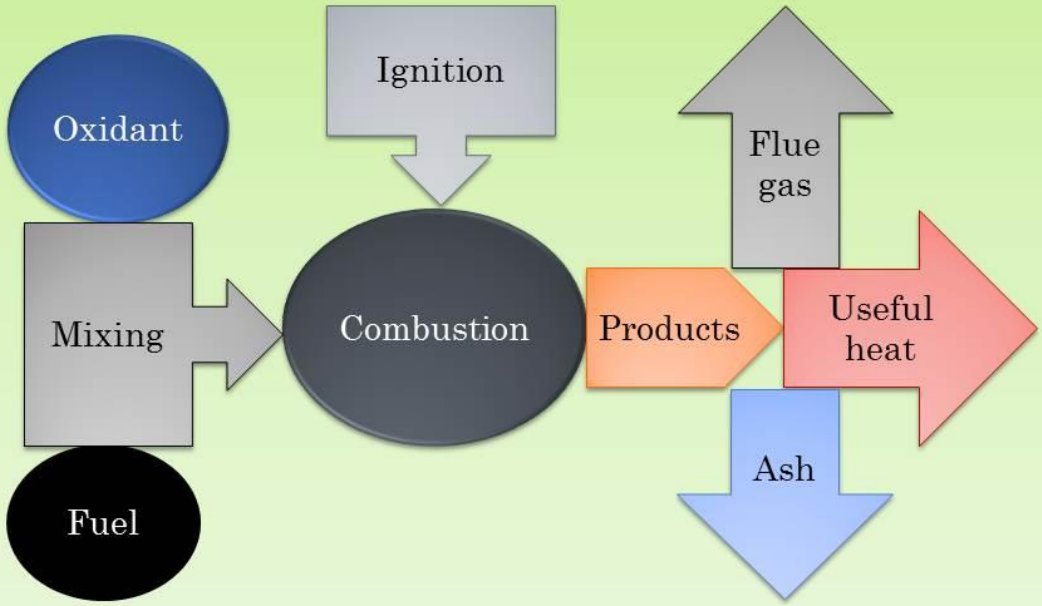
- Pioneered energy audits in India
- Highly experienced multi disciplinary team of about 30 engineers at Delhi & Bangalore
- 2000+ assignments on detailed energy audits completed
- Bank of latest portable instruments/software
- Temperature pressure, flow, electricity, water analysis, illumination, gas analysis and softwares (simulation, efficiency calculation)
- Good networking with major equipment suppliers
- Feedback system/post energy audit assignments

Types of fuels

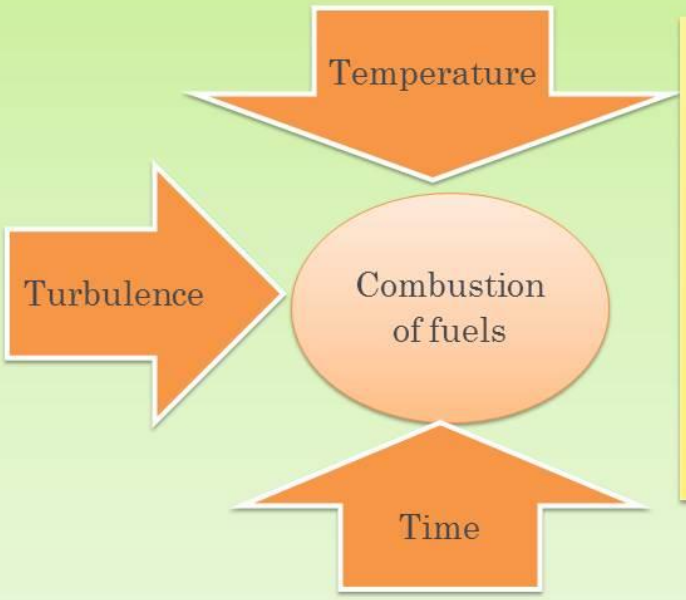
- Solid fuel
  - Coal, biomass, petcoke
- Liquid fuel
  - HSD, LDO, FO, RPO
- Gaseous fuel
  - Natural gas, LPG

These fuels not only have different physical state but have different composition, heat values and combustion products

Combustion process



3Ts of combustion



3Ts - Temperature, Turbulence and Time are most important which dictate effectiveness of combustion in a thermal system

Excess air required for combustion

Fuel type	Excess air (%) (by volume)	Air to fuel ratio (kg/kg fuel)
Solid fuels	25 – 60	7 – 8
Liquid fuels	15 – 35	14 – 15
Gaseous fuels	10 - 20	15 – 17

Maintain correct air fuel ratio i.e. excess air to minimise unburnt formation and flue gas losses

Products of combustion

- Complete combustion of C forms CO_2
- Partial combustion of C
  - CO (generate less heat and pollution)
  - C (soot- not only loss of heat output but reduce heat transfer rate due to deposition of soot on the surface)
- H2 forms H2O
- Other gases depending upon the chemistry of fuel being burnt

Combustion of carbon

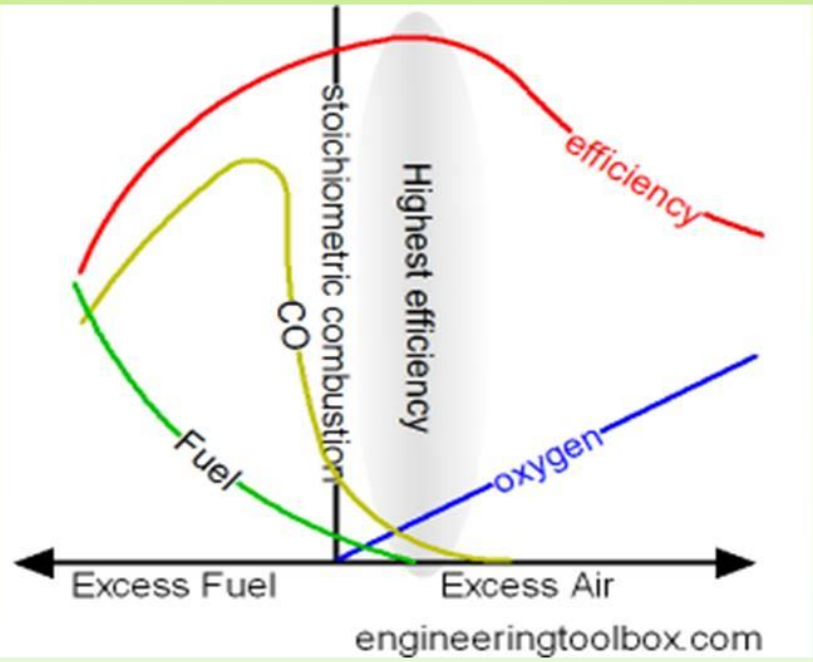
During complete combustion,

$$C + O_2 \longrightarrow CO_2 + (-393\ kJ/kg)$$

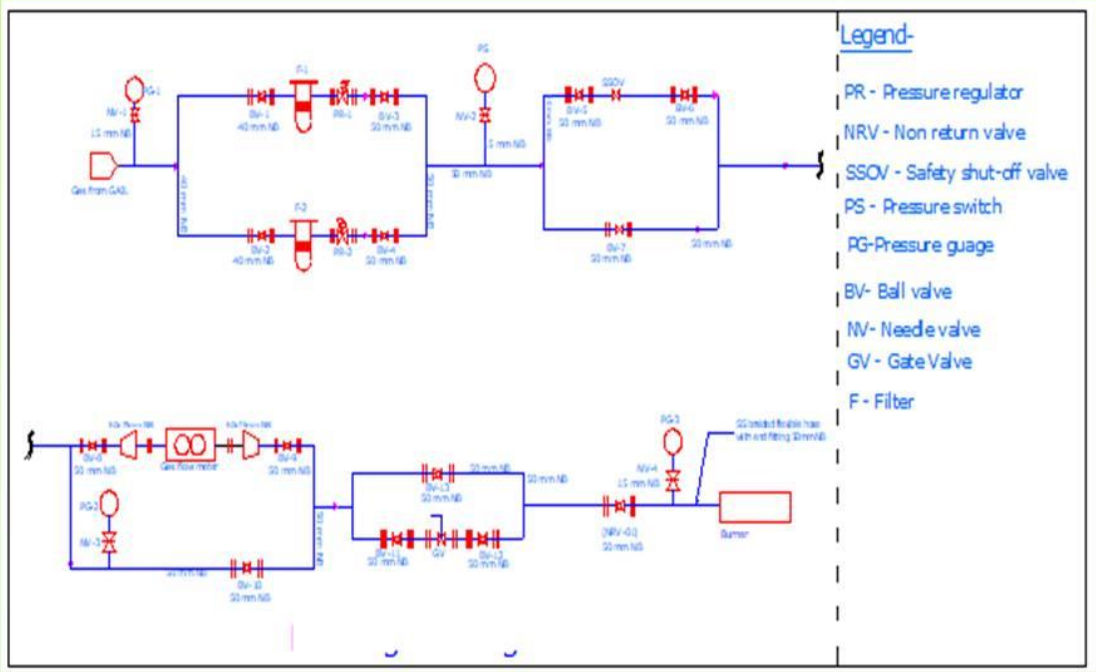
In case the combustion is incomplete

$$2C + O_2 \longrightarrow CO + (-99\ kJ/kg)$$

Effect of excess air



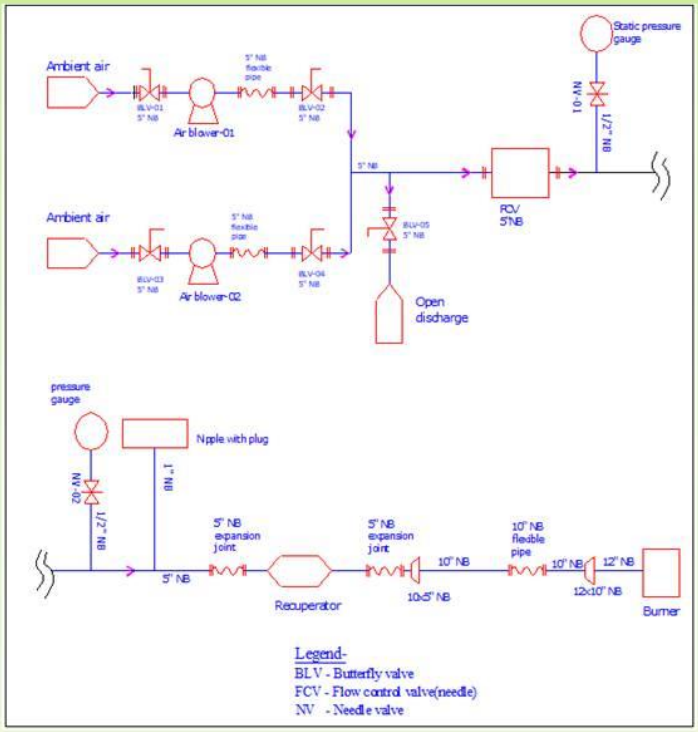
Gas train – schematic view



Air train – schematic view

Air train components:

- ID/ FD blowers
- Pressure gauge
- Air flow meter
- Control valves
- By-pass lines



Benefits of NG fired kilns

- A combination of properly designed tunnel kiln with natural gas as fuel can enhance the overall yield of the plant and reducing rejections to a minimum level
- High combustion efficiency for natural gas is possible thereby extracting maximum heat from fuel
- A properly designed kiln can be equipped with automation and reduce dependency on skills of operators
- Being clean fuel, use of NG will reduce greenhouse gas (GHG) emissions
- Helps in better workplace environment
- Easy to handle fuel
- Since it is a piped gas, there is no need to keep inventory of fuel
- Pricing of natural gas is decided based on calorific value

Thank you

20th Feb 2018 | HONEYWELL THERMAL SOLUTIONS

Honeywell

2

Honeywell Portfolio

Honeywell

Honeywell brand commercial combustion products provide solutions for HVAC and burner and boiler control systems to help streamline integration, installation, and end-user interaction while improving efficiency and performance. Our key products include programmers and primaries, valves and actuators, limits and pressure controls, communications and software. Applications include burners, boilers, furnaces, packaged rooftop units, kilns, water heaters and more.

Honeywell Eclipse

Honeywell Eclipse offers a comprehensive range of gas, oxygen, and oil burners, recuperators, heat exchangers, and fully engineered combustion systems. Eclipse products deliver safe, reliable, efficient, and clean heat for high and low temperature applications in all types of industrial heating processes. Eclipse application engineers can design custom solutions that are configured to meet specific customer requirements. Our team of factory authorized technicians provides an extensive range of customer support services.

Honeywell Kromschröder

Honeywell Kromschröder manufactures gas combustion and controls serving both the Heating and Process markets. Kromschröder's wide product portfolio encompasses the entire combustion safety and control system. From filters and regulators, to safety shut-off and control valves, to the burner management system; Kromschroder offers controls and solutions to provide safe and reliable combustion with progressive and energy efficient technology.

Honeywell Maxon

Honeywell Maxon provides integrated burner solutions and engineered combustion systems for industrial process heating applications. Maxon's complete line of combustion solutions equipment includes gas and oil burners, gas and oil valves, hazardous area shut off valves, low NOx and Ultra low NOx burners, and flow control technologies. Maxon products are utilized by almost every manufacturing industry including oil and gas, pulp and paper, automotive, textile, building materials, metals, glass and ceramics, foods and agriculture.

3

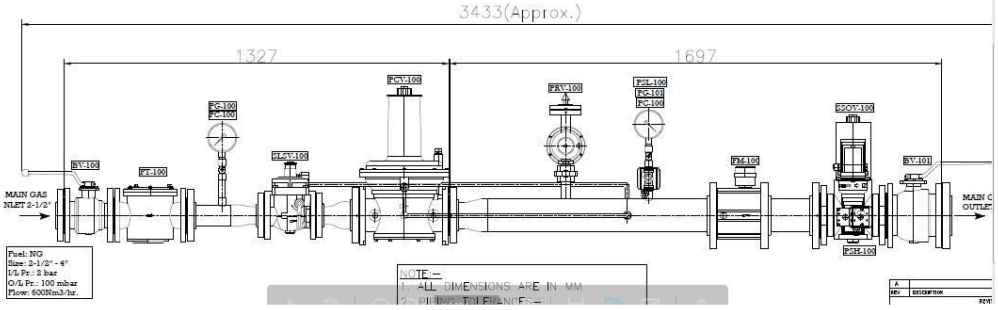
Gas Train Products

Honeywell
THE POWER OF CONNECTED

4

Gas Train Components

Tag No.	Components
BV-100	KS03152348 - VALVE,AKT 65F160G MAN SHUT OFF
PG-100	KS03200121 - RFM 4RB100 PRESSURE GAUGE
PC-100	841010417 - Valve, Push Cock, 1/2 inch, For Pressure Gauge
FT-100	KS81942103 - Gasfilter, GFK 65F60-6, DN65, Flanged
SLSV-100	KS03151134 - Valve, Safety Shutt-off, JSAV 50F50/1-0, DN50
PCV-100	KS86050010 - Governor, Gas, VGBF 80F40-3, DN80
PG-101	KS03200109 - KFM 250RB100 PRESSURE GAUGE
FM-100	KS03200402 - Flowmeter, DM 400Z100-40
PSL-100	KS84447350 - Switch, Pressure, Gas, DG 50U-3, 2.5-50 mbar
PSH-100	KS84447500 - Switch, Pressure, Gas, DG 150U-3, 30-150 mbar
PRV-100	KS84583010 - VALVE,SAFETY RELIEF,RP1,GAS, VSBV 25R40-4
SSOV-100	KS88202675 - VALVE, SOLENOID, 100 MM, VAS8100F05NWE
BV-101	KS03152350 - VALVE,AKT 100F160G MAN SHUT OFF



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Honeywell Kromschröder – Controls for gas

Ball Valves & Filter

Manual Valves

- Designation-AKT
- Primary Use:
  - Used for shutting off air, light and heavy fuel oil, water, and all types of gas.
- Available Sizes:
  - 6-250/200 = mm (3/8 – 2")
- Mounting Position:
  - Arbitrary
- Maximum Pressure
  - 50 = 5 bar
  - 88 = 8.8bar
  - 160 = 16bar
- Housing Material
  - B = Brass Housing
  - C = Two part housing, GGG 40; Ball, Stainless Steel
  - G1 = Two part housing, GGG 40; Ball, Cast Steel
  - S = Steel Housing
  - M = suitable for biologically produced methane

Filters

- Designation-GFK
- Primary Use:
  - Installed in the inlet of the gas train to filter out all debris that might contaminate the system from the piping. A filter is required by NFPA on all new gas trains. A filter can also be installed on individual burner trains.
- Available Sizes:
  - ½" - 4" N = NPT, A = flanged ANSI
  - ½" - 2½" available in NPT
  - 2½" - 4" available in flanged ANSI
- Available Pressures:
  - 15 PSI (1 Bar) and 60 PSI (4 Bar)
  - 1 Bar = 10 4 Bar = 40
- Filtering Ability:
  - 50 micron (Standard) - 10 micron (Special)
- Mounting Position:
  - Arbitrary
- Available Spare Parts:
  - Filter media pads, O-rings
- Note:
  - When sizing a filter it is recommended to have less than a 4" pressure drop if possible.

Gas Pressure Regulators

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Gas Pressure Regulator VGBF

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- Spring loaded pressure regulators for gaseous media
- Regulator to maintain the outlet pressure constant despite changing gas flow rates and inlet pressures in gas pipelines
- Design with inlet pressure compensation diaphragm ensures high control accuracy
- Zero shut-off
- Thanks to an additional safety diaphragm, no breather line required
- Internal impulse (VGBF..05)

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Gas Pressure Regulator VGBF

- Gas types:
  - natural gas, town gas, LPG (gaseous) and biologically produced methane (max. 0.02 %-by-vol. H2S)
  - VGBF..L also for air.
- Inlet pressure range:
  - up to 500 mbar (7.25 psig)
  - 1 bar (15 psig)
  - 4 bar (60 psig).
- Nominal size:
  - VGBF..05: 40-150
  - VGBF..10: 15-150
  - VGBF..40: 40-100.
- Internal thread:
  - Rp to ISO 7-1, NPT to ANSI/ASME.
  - Flanged connection: PN 16 pursuant to ISO 7005, ANSI flange pursuant to ASA.
- Outlet pressure ranges:
  VGBF 15 – 50: 5 – 350 mbar (2 – 137 "WC),
  VGBF 65, 150: 5 – 160 mbar (2 – 62 "WC),
  VGBF 80, 100: 5 – 350 mbar (2 – 137 "WC).
- Certification
  VGBF..05: Class A (EN 88-1).
  VGBF..10, VGBF..40 (EN 88-2):
  Accuracy Class: AC 10,
  Lock-up pressure class: SG 30.
- Control range: 10:1

Safety Shut-Off Valve JSAV

- For positive pressure with over-pressure shut-off
- DN 25, DN 40: with under pressure shut-off
- Large adjusting range for trip pressure
- Low pressure loss
- DN 25, DN 40: no purge line required
- Max. test pressure for testing:
  - inlet / outlet: temporarily < 15 min. 6 bar (87 psig)
  - impulse line: temp. < 15 min. 750 mbar (10.8 psig)
- Trip pressures pdo/pdu pre-set at the factory:
  - upper trip pressure pdo: 120 mbar (46.2 "WC)
  - lower trip pressure pdu: 10 mbar (3.9 "WC) (JSAV 25-40)
- Accuracy Class: AC 10.

Safety Relief Valve VSBV

- Gas types:
  - natural gas, town gas, LPG (gaseous) and biologically produced methane (max. 0.02 %-by-vol. H2S).
- Inlet pressure range:
  - up to 4 bar (58 psig)
- Nominal size:
  - DN 25
- Internal thread:
  - Rp to ISO 7-1, NPT to ANSI/ASME.

Air / Gas Ratio Control GIK

- To maintain a constant gas/air mixture
- For continuous and staged burner control
- Design with inlet pressure compensation diaphragm ensures high control accuracy
- Wide control range
- Bypass screw for low fire

Variable Air / Gas Ratio Control GIKH

- For maintaining a constant mixture of gas and air on systems using preheated air
- Design with inlet pressure compensation diaphragm ensures high control accuracy
- Variable air/gas ratio controls (4:1) with differential pressure measuring unit for the control pressure
- Bypass screw for low fire
- Wide control range

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Kromschröder Safety Shutoff Valve Overview

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valvario® VAS, VCS

- Dual-seated single solenoid valves
- For main gas and burner manifolds
- From 3/8”(DN10) to 5”(DN125)
- Worldwide approvals
  -
- POC (proof of closure) travel switch with visual indication
- Suitable for high-duty cycling
  - Size 1-3: >15MM@30cyc/min
  - Size 6-8: >6MM@30cyc/min
  - Size 9: >6MM@2cyc/min

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valvario® VAS, VCS

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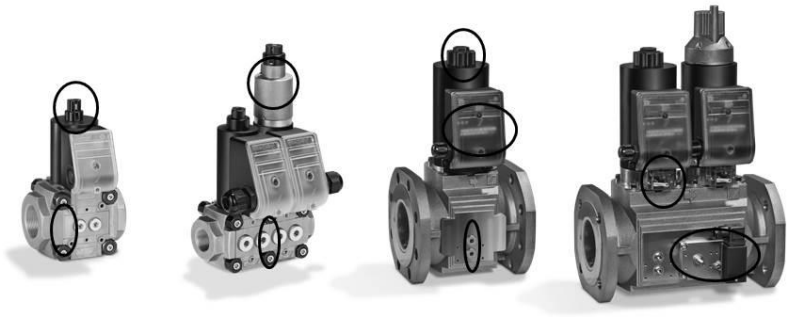

VAS..1-3 | VCS w/ dampening unit | VAS..6-9 | VCS w/ POC & DG

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VAS..N, VCS..N

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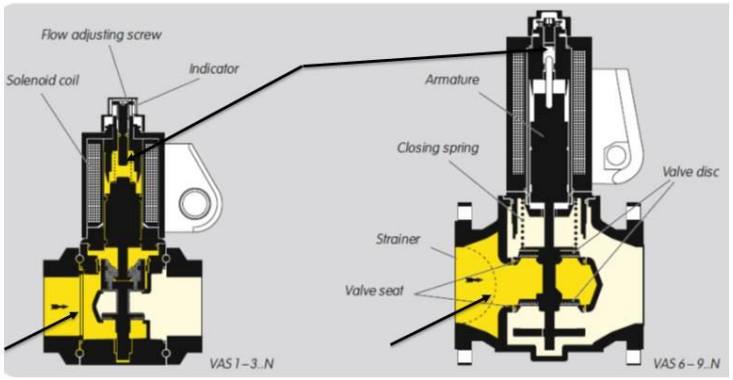

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valvario®

VAN

Honeywell
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- Normally Open Solenoid valve
- For main gas manifolds
- From 3/8”(DN10) to 2” (DN50)
- CPS (closed position switch) valve seat switch with visual indication
- Suitable for high-duty cycling

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Combination Valves

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VAD, VAG, VAH, VAV

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- Servo regulator for gaseous media with integrated safety shutoff valve
- High control quality
- Suitable for intermittent operation
- Minimum installation effort: no external sensing line required
- Worldwide approvals
- Closed Position Switch with visual indication
- Suitable for high-duty cycling
- Size 1-3: >15MM@30cyc/min

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valVario®

VAD, VAG, VAH, VAV

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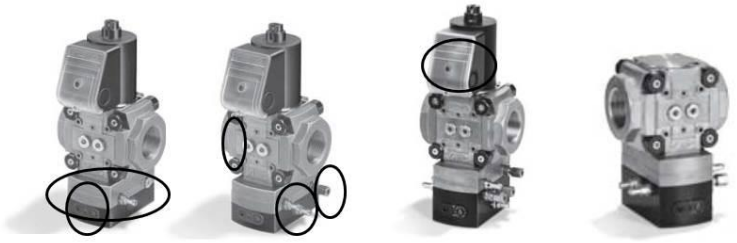

VAD..1-3 VAG/VAV..1-3 VAH..1-3 VRH..1-3

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Valve Proving System - TC

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- Primary Use:
- Automatically checks both valves in the main gas train for leaks and will not allow the system to be started if a leak is detected. It is now a recommended option to the vent valve in all gas trains.
- Selection:
- TC1: for valVario
- TC2: for quick opening individual valves
- TC3: for manually reset or slow opening individual valves
- TC4: for control cabinet mounting
- Available Inlet Pressures:
- TC 116, 218, 318 = 7.25 PSI
- TC 410 = 8.5 PSI*
- Available Input Voltages:
- TC 218, 318, and 410 = 24, 120, and 220 V AC

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Gas and Air Pressure Switches – DG and DL

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- Construction:
  - The DG and DL are both diaphragm pressure switches with internal micro-switch.
- Materials:
  - Diaphragm – NBR
  - Upper Housing - Reinforced plastic, glass fiber.
  - Lower Housing - Die cast aluminum (DG series only.)
- Switch Capacity:
  - 30 to 240 VAC
  - 6.0 Amps

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Gas and Air Pressure Switches - DG

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- Model Number Designation
- Pressure Switch
- DG
- Adjusting Range
- 6 – 500 = 0.5 -500mbar (0.2 – 195")
- Function
- B = Positive Pressure
- U = Positive, Negative, or Differential Pressure
- H = Lock off with Rising Pressure
- N = Locks off with Falling Pressure
- I = Negative pressure for gas
- S = Positive Pressure, Oxygen, Ammonia
- Contact Rating
- (omit) – Standard (silver)
- G = Gold-plated contacts (,30V)

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Honeywell Kromschröder Control Valves and Actuators

Butterfly Valves

Butterfly valves BV..

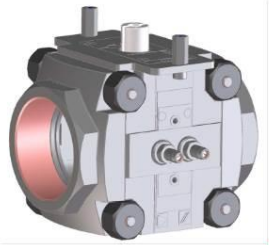
- Butterfly control valve
  - BVA: for air
  - BVG: for gas
  - BV..F: for “fine” control
- Sizes
  - 40 - 150mm (1-1/2 – 6”)
  - Available with single or double port reduction
- Mounting
  - Separate ISO and ANSI models
- Operating pressure
  - 05 = 500mbar (7.25psi)

Butterfly valves BVH..

- Butterfly control valve
  - BVH: for hot (450°C/800°F) air or flue gas
  - BVHS: with Safety Closing function
  - BVHM: for solenoid actuator
  - BVHR: High temperature 550°C/1,022°F
- Sizes
  - 40 - 100mm (1-1/2 – 4”)
- Mounting
  - Separate ISO and ANSI models
- Operating pressure
  - 01 = 150mbar (2.18psi)
- Special feature
  - Stop bar

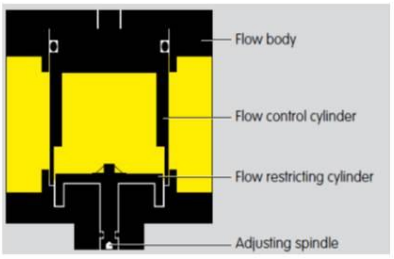
Adjustable port valve - VFC

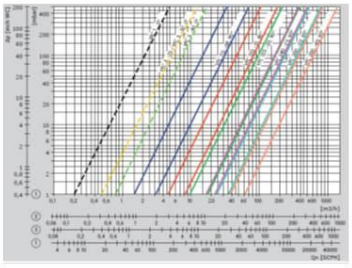
- Linear flow port valve
  - To adjust volumes of gas and cold air for control ratios up to 25:1
- Control Actuator
  - IC 20, 40
- Port sizes
  - 08 – 40mm
- Connection sizes
  - DN10 – DN65 (3/8 – 2-1/2")
- valVario body

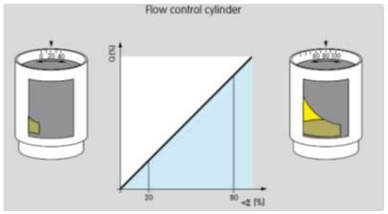


Adjustable port valve - VFC

- Characterized port for linear flow control
- Integrated flow restrictor without impact on control profile







Rotary valve actuators

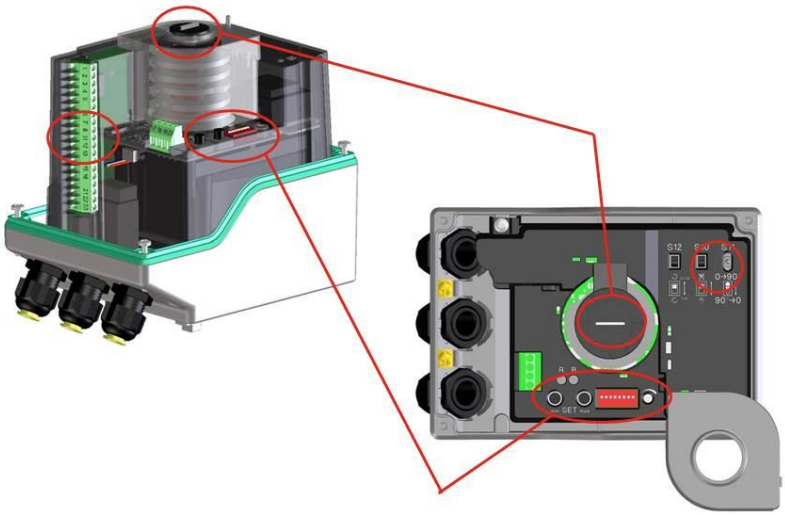
Rotary actuator – IC 20

- **Low torque actuator**
  - Direct couple to butterfly valves or linear flow controls.
    - Adapter brackets available
  - Control signal
    - Time proportioning
    - Position proportional
    - Two point step
    - Current proportional.
- **Torque:**
  - 22 or 26 in-lb
- **Speeds:**
  - 90 degrees in 3, 7, 15, 30, and 60 sec
- **Input Voltages:**
  - 120, and 220 VAC
- **Feedback Signals:**
  - IC 20 = 150 and 1000 ohm, and 4-20 mA
- **Special Features:**
  - Manual set-up control
  - Status indicator lights

Rotary actuator – IC 50

- **Medium torque actuator**
  - Direct couple to position butterfly valves or linear flow controls.
  - Control signal
    - Time proportioning
    - Position proportional
    - Two point step
    - Current proportional..
- **Torque:**
  - 22 or 265 in-lb
- **Speeds:**
  - 90 degrees in 3, 7, 15, 30, and 60 seconds
- **Input Voltages:**
  - 24, 120, 220V AC
- **Available Feedback Signals:**
  - IC 50 = 500 ohm, current or 4-20mA
- **Special Features:**
  - Manual actuator set-up

Rotary actuator – IC 50



Honeywell Kromschröder Flame safety

Burners

Multi-Burner and Pilots Overview

- **Velocity Burners**
  - BIO/ZIO, BIC/ZIC with ceramic tube, BIC..M, BIC..L, BIC..R
  - ThermJet TJ and TJPCA, ExtensoHeat
- **Long Flame and Combo's**
  - Kinemax, Wide-Range, TriOx, BBG/BBC, NMC, 780P
- **Flat Flame Burners**
  - BIO..K, WHG/RKG, WHI
- **Self-recuperative Burners** for direct and indirect heating
  - ECOMAX, SICAFLEX and SER-C
  - TJSR and SER
  - BICR
- **Radiant Tube Burners** for U and W shaped tubes
  - Tube firing burner TFB, Bayonet Recuperator BU
- **High temp Heat Exchangers**
- **Pilots**

Check individual literature whether capacity numbers are based on LHV or HHV!

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Thank You

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