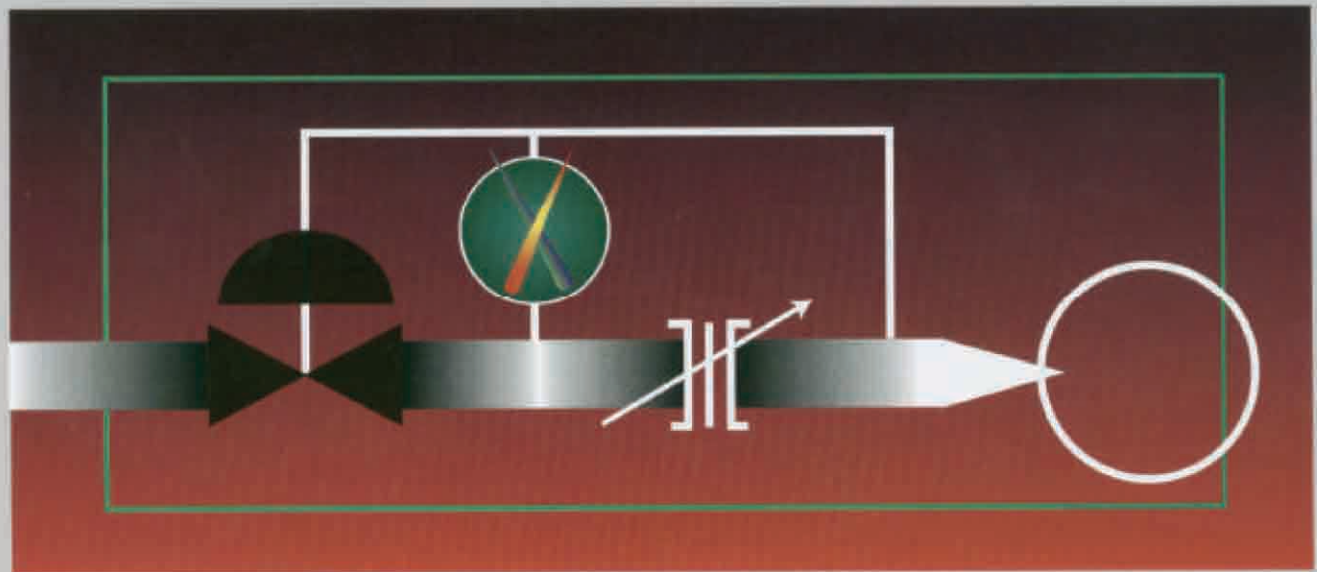


IRCD



**Haskel Range of
Injection Rate Control Devices**

Haskel International, Inc. has nearly 60 years of hydraulic and pneumatic engineering experience in the design and manufacture of one of the widest ranges of air-driven liquid pumps, chemical injection pumps, gas boosters, air pressure amplifiers, accessories and systems available in today's market.

Located in Burbank, California, USA with a further manufacturing plant in Sunderland, U.K., the company has strategically placed offices and dedicated distributors throughout Europe, Asia, Pacific Rim and the Americas.

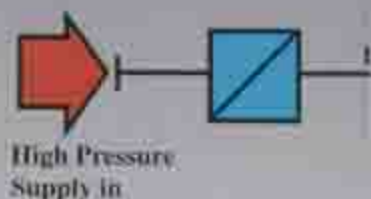
In 1997, Haskel International, Inc. acquired Palpro Ltd. located in the United Kingdom. The Palpro IRCD (Injection Rate Control Device) is a unique and revolutionary system for multi-point injection of chemicals into oil and gas production systems.

A continuous investment in the most modern machinery and technological advances ensures Haskel remains among the leaders in the field of chemical injection.



IRCD Principle of

By using a biased dome regulator to maintain a constant differential pressure across the flow control valve, a constant flow is provided throughout the system, provided that the flow control valve (variable orifice) does not alter. This ensures that fluid through the IRCD will only change if the flow control valve is adjusted.



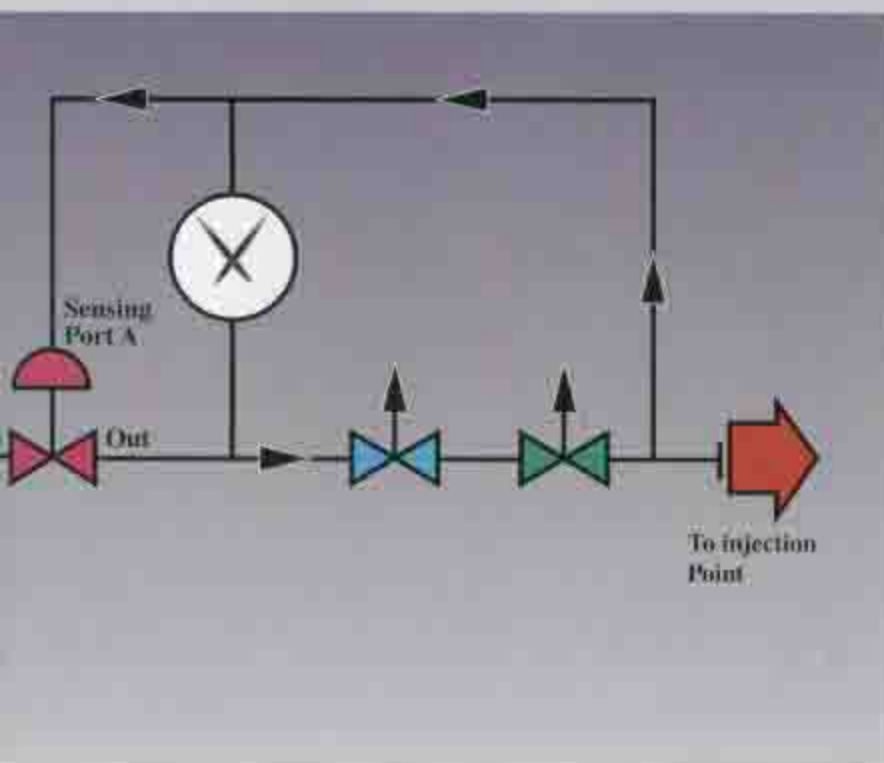
How the IRCD Operates

The Haskel IRCD is a unique and revolutionary system for the multipoint injection of chemicals into Oil and Gas production systems. The IRCD can be supplied as individual units or in a panel configuration which can be installed adjacent to the point of injection.

Additionally, they require only one high pressure feed line from either an air or electric-driven chemical injection pump, no matter how many injection points the system may contain.

Capable of handling flow rates as low as 20 ml/hr. and up to 5,000 L/hr. with injection pressures up to 15,000 psi, the IRCD has no moving parts, requires no electric power and is silent during operation.

Operation



Features and Benefits:

Accurate

- Flow rates as low as 20 ml/hr.
- Flow rates as high as 5,000 L/hr.
- Pressure ratings up to 15,000 psi

No Moving Parts

- Requires one high pressure line reducing the number of pumps required, regardless of number of injection points
- Reduces maintenance cost
- Reduces the problem of leaks

Built to Your Specifications

- Supplied individually or in panel configurations

For more detailed information, refer to the "Benefits of the IRCD Over Conventional Chemical Metering System".

Compare the Two Systems



Typical Multi-Pump System with numerous pipe runs and large skid obstructing direct access to the pumps. The increased number of pumps leads toward increased maintenance, larger and more expensive construction.

The Haskel injection rate control device system provides many advantages over conventional pump systems as these photographs illustrate.

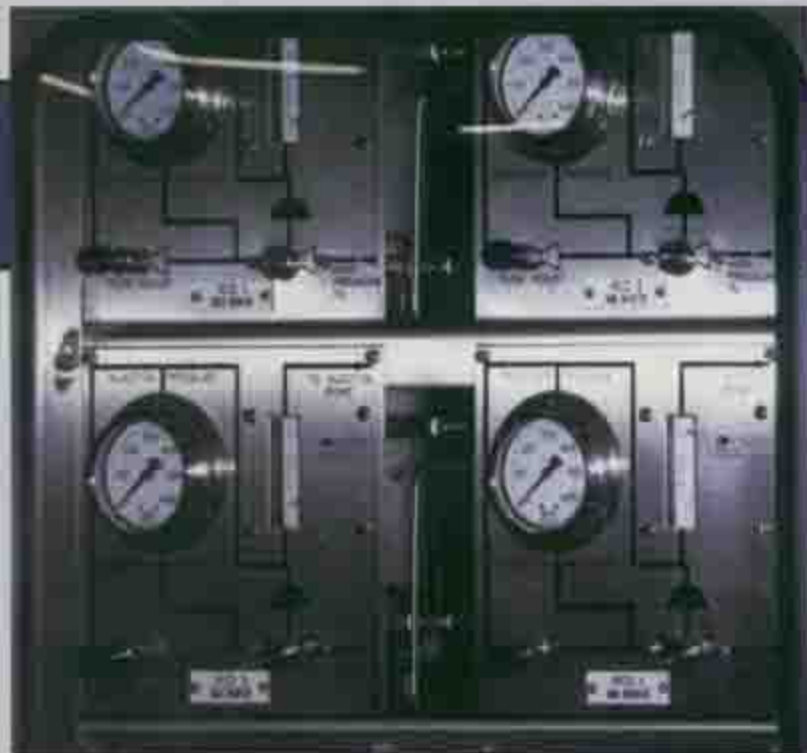
Shown in the top photograph is a typical multi-pump system designed to inject chemical into 26 injection points. The size required by the skid, not including storage facilities, was over 20' x 7'.

In comparison, the IRCD system shown in the photograph below injects into 16 injection points in a space 10' x 3' or approximately one third the area and weight of the conventional system.

When a comparison is made between the two systems, the numerous advantages and savings offered by the Haskel IRCD system is clearly seen.



Typical Haskel IRCD panel injecting chemical into 16 injection points, utilizing only one small pump and one square. Note the apparent ease of operation and layout.



Benefits of the IRCD Over Conventional Chemical Metering Systems

Smaller space Requirements

The Haskel system saves considerable space over conventional systems requiring separate metering pumps for each injection point.

Less Weight

In many cases, up to 120 lb per injection point can be saved by removing the metering pumps, pipework, motors and skid steelwork.

Lower Installation Cost

On-site installation costs are substantially reduced as the IRCD system requires only one high pressure line from the feed pump to the area of injection point(s). Compared to multi point metering pump installations requiring multiple runs of high pressure tubing to the point of injection(s), significant savings of time and expense can be realized with the elimination of leaks.

Easier to Add Units to Existing system

The IRCD system can be expanded easily by adding further units or feeding into the ring main.

Less Pumps Used

Reduction in the number of pumps utilized allows substantial savings in capital, maintenance, spare parts and weight.

No Moving Parts

No glands and a reduction in tubing runs equates to fewer leakage problems, associated safety problems and less of expensive chemical.

Less Maintenance

The IRCD with no moving parts requires considerably less maintenance and allows for quick and easy removal.

Control at the Point of Injection

Control of the injection rate is achieved by fitting the IRCD directly at the injection point. Injection is not affected irrespective of the length of the injection line.

Local or Remote

Actual Flow Indication

Units can be fitted with either an electronic flowmeter with $\pm 0.2\%$ accuracy (standard) or a built-in VA meter.

Smooth Flow at the Injection

Point Improves Performance

Metering can become inaccurate when pumping into long discharge lines. The Haskel IRCD system avoids this problem due to the smooth flow and the ability to control the flow rate right at the injection point.

Not Susceptible to

Temperature Extremes

Suitable for all environments.

Designing Your IRCD System

One of the advantages of the Haskel IRCD is the reduction in the number of positive displacement pumps needed. Only one operative air or electric-driven pump per chemical is required. The sizing of this pump is very important. When considering the use of the Haskel IRCD, the following parameters should be defined:

1. *The maximum total volume of fluid to be injected, taking into consideration future expansion.*
2. *The single highest pressure that is to be expected, again taking into consideration future expansion.*

Once these questions have been answered, the selected pump should have an output capacity of 120% of the maximum system demand. The output pressure should be 400 psi higher than the single highest point known or expected.

For example:

Injection Point	Flow Rate	Injection Pressure
1	3 to 10 L/hr.	400 psig
2	1 to 7 L/hr.	800 psig
3	0 to 11 L/hr.	2,000 psig
4	0 to 2.5 L/hr.	3,000 psig
Future 5	7 to 20 L/hr.	200 psig
Future 6	7 to 15 L/hr.	200 psig

Total Maximum Flow 65.5 L/hr. at 3,000 psig.

Using the parameters listed, the selected pump must be capable of $65.5 \times 120\% = 78 \text{ L/hr. at } 3,400 \text{ psig.}$

The preferred method of controlling ring main pressure is by using a back pressure control valve that provides a constant bleed of excess fluid back to the supply tank. This valve can be spring or gas loaded. Gas loaded valves are preferred as they provide better accuracy and control of the ring main pressure. See diagram (next page) for a typical installation.

Typical Questions and Answers:

Will flow be affected if I change the flow rate, isolate the IRCD, or if the ring main or injection pressures change?

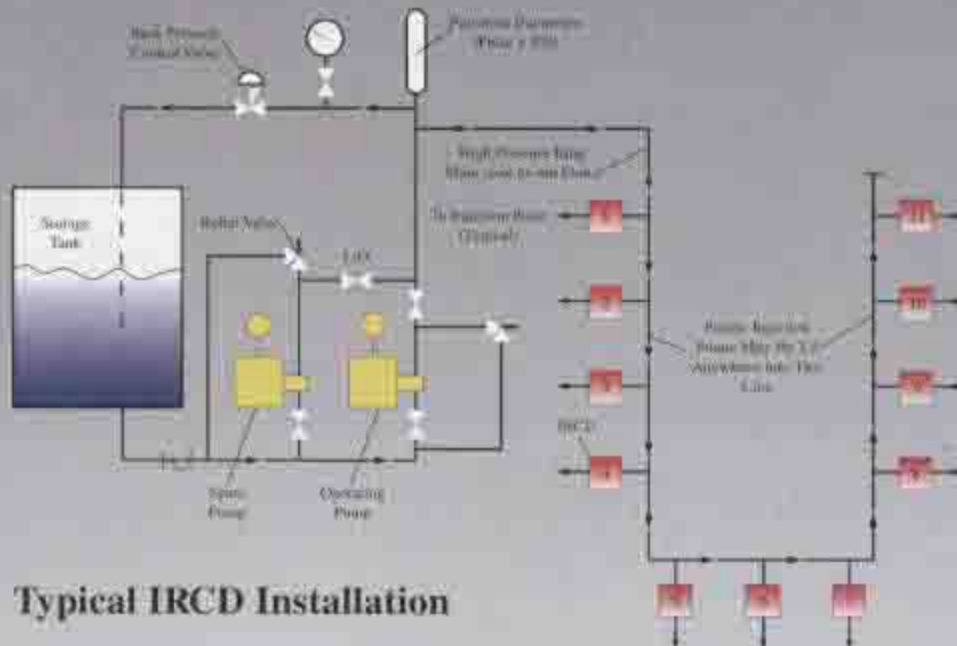
No. All of the IRCD's operate independently of other units in the system. They are designed to inject at a set rate irrespective of system pressure fluctuations.

What type of pump should I use?

Any positive displacement pump such as Haskel's chemical injection pump series will be suitable.

What flow turndown can I expect with my IRCD?

If you are using a Coriolis meter to calibrate your IRCD, then you will achieve a turndown of up to 100 to 1. When using a VA meter, you can expect a turndown of up to 20 to 1.



Low Flow System Specifications

MODELING NUMBER	STANDARD UNIT	HIGH PRESSURE UNIT
Max. Operating Pressure	10,000 psig / 690 bar	15,000 psig / 1,034 bar
Flow Range	0 to 84.5 gph / 320 lph	0 to 84.5 gph / 320 lph
Materials of Construction		
Metals	316 Stainless Steel	Duplex Stainless Steel
Elastomer	Perfluoro	Perfluoro



Medium Low Flow System Specifications

MODELING NUMBER	STANDARD UNIT	HIGH PRESSURE UNIT
Max. Operating Pressure	10,000 psig / 690 bar	15,000 psig / 1,034 bar
Flow Range	53 gph / 200 lph to 530 gph / 2,000 lph	53 gph / 200 lph to 530 gph / 2,000 lph
Materials of Construction		
Metals	316 Stainless Steel	Duplex Stainless Steel
Elastomer	Perfluoro	Perfluoro



High Flow System Specifications

MODELING NUMBER	STANDARD UNIT	HIGH PRESSURE UNIT
Max. Operating Pressure	6,000 psig / 1,034 bar	15,000 psig / 1,034 bar
Flow Range	530 gph / 2,000 lph to 1,122 gph / 5,000 lph	530 gph / 2,000 lph to 1,122 gph / 5,000 lph
Materials of Construction		
Metals	316 Stainless Steel	Duplex Stainless Steel
Elastomer	Perfluoro	Perfluoro

Haskel Your International Flow Distribution Partner.

Consider the benefits of owning an IRCD.

- With subsidiaries and distributors around the world your IRCD can be serviced by Haskel trained technicians wherever the installation.
- A wide range of flows
- Over 15 years experience of solving customers liquid flow distribution problems.

All of this backed by a world class international company.

For more information contact your nearest office or find us at www.Haskel.com

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