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APPLICATION DESCRIPTION

## Totalflow well pad remote terminal units

Peyto Exploration and Development / Alberta / Canada

Standardized natural gas well pads improve upstream production efficiency by Sheldon Ford, Peyto Exploration and Development



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### Introduction

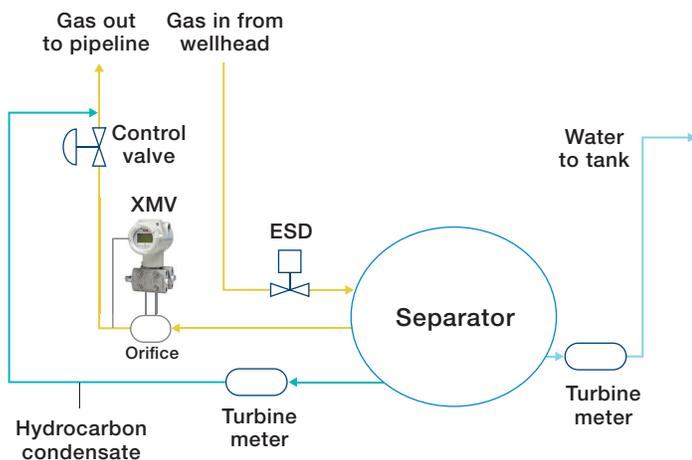
Peyto Exploration and Development in Alberta, Canada has experienced significant savings and natural gas production efficiencies by standardizing well pad designs. The company now has 20 identical well pads located in its Sundance fields about 175 miles west of Edmonton. Each well pad contains two to four wellheads. Horizontal drilling permits consolidating the four wellheads into a single pad.

A single remote terminal unit (RTU) controls operations of an entire pad. Data from the RTU connects via wireless to the company's supervisory control and data acquisition (SCADA) system. Operators anywhere in the field can log into the SCADA system to view well pad variables and change control and logic parameters.

## Wellhead design

Raw gas from each wellhead flows through a 3-phase separator. Gas, hydrocarbon condensate, and water are measured after separation as shown in Figure 1. Transmitters monitor tubing and casing pressures for each well. Turbine meters measure volumes of the condensate and water. The separated water flows to a shared water tank where it is trucked for disposal. The condensate is recombined with the gas downstream of an outlet control valve, as shown.

An ABB multivariable XMV transmitter connected across an orifice in the gas line measures differential and static pressures, as well as temperature. The RTU, an ABB product called the Totalflow RMC-100, calculates volumetric gas flow using these variables. It contains Totalflow input-output (TFIO) modules to provide analog, digital, and pulse IO, as well as valve interface functions and communication ports, for the entire well pad.



**Figure 1:** Each wellhead has a separator, producing flows of gas, hydrocarbon condensate, and water.

The RTU operates a Kimray outlet control valve in the gas line to regulate gas flow rates and pressures. For intermittent and plunger well operations, it also opens and shuts the gas line. Typically the RTU shuts the well on low gas flows, and opens it based on the pressure differential between the well tubing and pipeline pressure. The RTU comes with built-in PLC software functions for intermittent and plunger wells. In some cases the on/off well operations are simply timed.

If necessary, the RTU operates emergency shutdown (ESD) valves located at each wellhead and prior to each separator. The ESD valve protecting the separator shuts gas flow on high and low pressures. The ESD protecting the flow line, downstream of the wellhead, shuts down the gas flow on high and low tubing pressure as well as high and low gas flow rate. The RTU can shut down individual wells or the entire well pad, such as when the water tank levels are too high or any other such variable that might be chosen. Applications for shutdown functions also come pre-installed on the RMC-100 RTU.

## Field well pads

About six months of the year the well pads experience below freezing temperatures. As a result the separators, orifice runs, outlet control valves, and liquid metering reside inside enclosed sheds, one for each wellhead, Figure 2. Infrared gas catalytic heaters fueled by well gas heat the buildings. The water tanks are similarly heated to prevent freezing.

Power for the well pads come from 12-volt DC batteries charged via a regulator and solar panels. Typically a pad runs off six 120 amp-hour batteries and two to three 125-watt solar panels.

Realtime and trend data from the RMC-100 RTU communicates with the Peyto Cygnet SCADA system via a wireless mesh network, as well as 900 MHz spread spectrum radios, shown below. Recently Peyto started using ABB Tropos networks for these wireless transmissions.

Well pad information collected by the SCADA system from the RMC-100 RTUs includes gas volume, gas flow rate, differential pressure, static pressure, flow time, condensate and water volumes for the current day as well as high resolution gas flow rate, tubing, casing, and pipeline pressures real-time and trends. Operators can also view plunger and intermittent operational data from the applications on the RTUs.

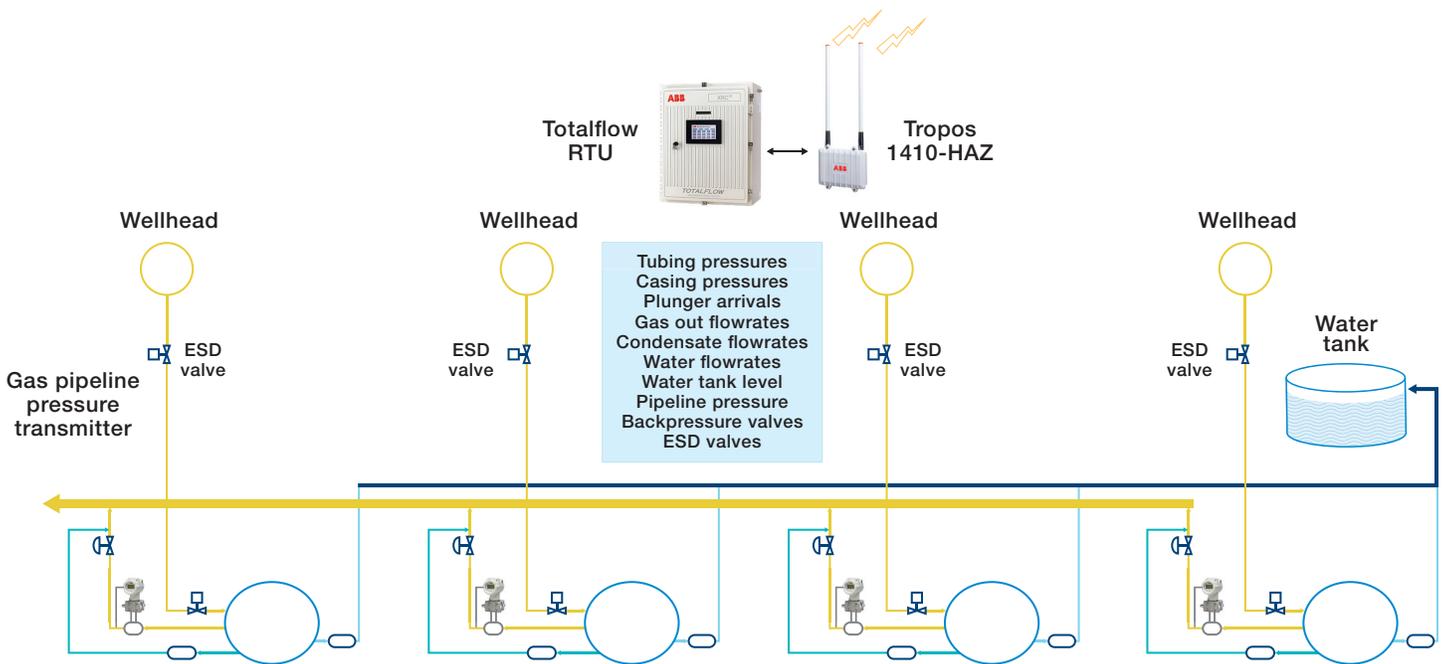
## Standard peyto wellpad

Advanced options within the RMC-100 RTU plunger and timer control application have given Peyto a large toolbox to choose from for optimization, offering solutions that were not previously available on all sites. Field operators can choose from many different opening and closing conditions based on pressure differential, flow rate, high/low pressure, time, rise or slope to name a few. These additional options have proved beneficial in optimizing well sites in different situations as well as reducing man hours spent at site.

Peyto's assets in the Sundance area consist of approximately 624 (2182 stacked) net sections of land over approximately 2200 square kilometers. The SCADA system collects information from about 750 well sites in these fields. Each field contains a building with a control room to house computers for the SCADA system. Field operators often use tablets to log into the SCADA system to view well pad operations and change control and logic parameters.



Figure 2: The well pads experience freezing temperatures for half the year, so many well pad functions are contained in heated sheds (background), one for each wellhead.



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