ptrc
Petroleum Technology Research Centre

CELEBRATING 20 YEARS

Global Reach & Local Impact

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Annual Report

(Cover) Dots on the world map represent the location of many of PTRC's collaborative partners in the past year.

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A LETTER FROM THE PRESIDENT AND CEO

November 2018 marked the 20th anniversary of the founding of the Petroleum Technology Research Centre – twenty years of innovative research, environmental stewardship, oil reservoir optimization, new field technologies, and the ongoing implementation of carbon utilization and storage.

The PTRC has become known internationally for its ground-breaking research. The Weyburn-Midale CO_2 Monitoring and Storage Project – which ran from 2000 to 2015 – remains a bellwether project across the globe for companies and jurisdictions planning their own CO_2 enhanced oil recovery projects. The learnings from Weyburn were instrumental in the development of CCS measurement and monitoring standards, with the participation of the USDOE, as well as different international governments, companies and organizations.

This experience then informed the PTRC's second CO_2 storage project, Aquistore, which is ongoing and has involved the participation of no fewer than 30 different sponsors and research groups. 2018-19 saw the Aquistore injection well – after five years of use – worked over to replace the metal tubing down to the full depth of 3.4 km. The work-over took place in May 2018, and injection has continued apace since then. Total CO_2 stored at the Aquistore site surpassed 180,000 tonnes in December.

The PTRC was formed those 20 years ago with an initial goal of improving recovery from Saskatchewan's difficult-to-access heavy oil reserves, alongside developing a critical mass within the province of researchers able to develop innovative petroleum technologies at the two main universities and the Saskatchewan Research Council. On that goal, the PTRC has delivered. Past field and pilot projects like the Joint Implementation of Vapour Extraction program (JIVE) between 2005 and 2010, and collaboration with the Petroleum Technology Alliance of Canada (PTAC) on hot water vapour extraction in 2012, would not have been possible without the expertise developed over the past 20 years by Saskatchewan-based researchers.

2018-19 continued our vital research on heavy oil recovery, with a particular focus on solvent injection in cold heavy oil production with sand (CHOPS) reservoirs. Post-CHOPS cyclic solvent injection (CSI) has shown enormous promise with our industry partners for its potential to re-invigorate suspended and worm-holed wells – thus bringing down the costs and environmental impacts associated with drilling new wells and producing steam in thermal recovery processes. Several projects approved in 2018 are analyzing existing data from wormholed wells to model effective solvent injection processes, simulating CSI applications in non-wormhole regions, and identifying the properties of foamy oil production.

I am appreciative of the skilled professionals I work with everyday to help Saskatchewan meets its environmental and economic goals in energy production. To my dedicated staff at the PTRC – and to my supportive Board of Directors – I say thanks, and here's to continuing to build upon and surpass the successes of the past 20 years.

Dan MacLean

CEO and President

A LETTER FROM THE CHAIR

In September 2018, I had the distinct pleasure of attending the PTRC's 20th anniversary celebrations. I have been involved with the PTRC as a member of the Board since 2011, and it was very humbling and satisfying to review twenty years of PTRC successes.

The two-day celebratory events – a banquet and reception attended by the Saskatchewan Minister of Energy and Resource the Honourable Bronwyn Eyre, followed by a full day conference featuring panel discussions and plenary talks from key figures across the rich history of the organization – brought together previous CEOs, industry leaders and past/present researchers.

I was reminded throughout those two days of the evolution of the PTRC, from a strict focus on heavy oil recovery in its beginnings leading to environmental stewardship and the training of highly qualified personnel, many of whom have remained in Saskatchewan. The province is now on the cutting edge of technology development like carbon capture and storage, solvent injection, improved energy efficiency, and reductions in water use and land disturbance. Researchers come to Saskatchewan's two universities from around the world to work on PTRC-funded projects, learning and developing more efficient and environmentally friendly oil recovery technologies. These researchers improve: (i) the world energy production as they take their skills and apply these advances in other parts of the world, and (ii) Saskatchewan production as most researchers and students remain in Canada, contributing to the country's pool of skilled professionals.

I have been proud to help steward the PTRC these past two years as Chair of the Board of Directors. The company continues its important work in the Aquistore program – which added additional research funding from overseas and Canadian corporate clients this year – and the development of new solvent and other processes in both heavy and tight/light oil. The CT-scanner, purchased through a grant from Western Economic Diversification Canada, has seen its use in SRC projects grow exponentially this year, providing key insights that improve hydrocarbon recoveries.

I will be leaving the Board of Directors at the coming fiscal year, and have enjoyed my time as its Chair. To my fellow Board members, Dan MacLean and his dedicated staff, I say "thanks" and sincerely hope the coming twenty years prove as exciting and impactful as the last.

Rob Scammell

Chair, PTRC Board of Directors

COMPANY INFORMATION

The Petroleum Technology Research Centre (PTRC) is a not-for-profit corporation founded in 1998 to facilitate research and development and demonstration projects into enhanced oil recovery and carbon storage, with the goals of improving recovery rates while reducing the environmental footprint of the oil and gas industry.

It is the PTRC's mission to realize 5 billion additional barrels of oil reserves from Saskatchewan's existing oil-in-place over five years of R&D and field trials of new and improved technologies.

Founded by four partners - Natural Resources Canada, the Government of Saskatchewan, the University of Regina and the Saskatchewan Research Council (SRC) - the PTRC has fostered the expansion of enhanced oil recovery research capacity in Saskatchewan and Canada through funding and facilitating projects that are important to addressing the challenges faced by industry.

OUR VALUES

Vision

To be the organization of choice for collaborative petroleum research in Saskatchewan and Canada

Mission

To initiate and deliver research programs to enhance the efficiency of oil and gas production

Strategy

To initiate and coordinate oil and gas research with cumulative unrisked potential to deliver 5 billion barrels of incremental oil reserves over the next 5 years

> “To foster the capacity in Saskatchewan to conduct world-class research in the fields of primary heavy oil recovery and enhanced oil recovery; and, to lessen environmental impacts while improving oil production.”
>
> Petroleum Technology Research Centre

CELEBRATING 20 YEARS

20 years of research impacting Saskatchewan’s economy and resources

2018 marked an auspicious anniversary for the PTRC. It was in the month of November, 1998 that the PTRC was incorporated as a not-for-profit company specializing in heavy oil research and development.

The goals of that incorporated company were direct and specific: to foster the capacity in Saskatchewan to conduct world-class research in the fields of primary heavy oil recovery and enhanced oil recovery; and, to lessen environmental impacts while improving oil production.

So much has changed in 20 years. At the PTRC’s instigation and mentorship over a 15-year period (2000 to 2015) the IEAGHG Weyburn-Midale CO_2 Monitoring and Storage Project blossomed into the world’s leading project examining the storage and utilization of carbon dioxide in depleted oil reservoirs. Publications, including Best Practices, followed. The reputation of the PTRC has continued to grow with the ongoing deep saline CO_2 storage project, Aquistore, which surpassed the milestone of 180,000 tonnes stored from SaskPower’s Boundary Dam Carbon Capture Facility in 2018-19.

Additional field trials in the mid-2000s of different configurations of solvent extraction technologies under the Joint Implementation of Vapour Extraction (JIVE) program led to commercial-scale projects from Husky Energy that created hundreds of jobs and millions of incremental barrels of oil, utilizing production methods that reduced energy use.

PTRC was recognized as a Network of Centres of Excellence in 2009 by the Government of Canada, and deployed an additional $10.5 million dollars to research partners in environmentally impactful research such as oil field water treatment, enhanced waterflood technologies, and well optimization/remediation work.

All this was highlighted in September, 2018 with a banquet and special one day 20th Anniversary Conference at Government House in Regina. The banquet, opened by the Honourable Bronwyn Eyre, Saskatchewan’s Minister of Energy and Resources, included invited dignitaries from the United States, Government of Canada and research organizations across North America. The Minister spoke of the importance of PTRC to the economic and environmental well-being of the province.

The 20th Anniversary Conference itself included a unique combination of panel discussions and keynote speakers. Panels focused on the past, future and present of PTRC’s research, and plenary speakers such as Jim Sorenson from North Dakota’s Energy and Environmental Research Centre and Phil Anaquod of the Muscowpetung First Nation, spoke on the importance of international collaboration and engagement with First Nations Communities.

FOAMY OIL
CSI
AQUISTORE
HEAVY OIL
HORNET
TIGHT/LIGHT OIL
CO_2 (EOR & STORAGE)
WEYBURN-MIDALE
SASK CO_2 USER
JIVE
CENTRE OF EXCELLENCE
FOAMY OIL
CSI
AQUISTORE
HEAVY OIL
HORNET
TIGHT/LIGHT OIL
CO_2 (EOR & STORAGE)

Aquistore

An Injection Well Work-over and a New Peak in CO_2 Stored

Measurement and monitoring at the Aquistore CO_2 storage project had a focused but quieter year in 2018-19. In part, this was due to the work-over at the project's injection well in May 2018, which included replacing the metal tubing, re-installation of the fibre optic line and a replacement of the down-hole temperature and pressure sensors. The well surpassed its fifth year of operations this fiscal year, and the work-over was a necessary activity to assure strong injectivity and to replace some of the aging monitoring equipment.

Large scale injection resumed in late May, and injectivity has been excellent since the work-over completion. Total stored CO_2 surpassed 180,000 tonnes by the end of December 2018. Public assurance monitoring – Readings from ground water wells, soil gas measurements in the observation area, and monitoring of ground deformation through the use of tilt meters and GPS – continue to show no evidence of leakage to the biosphere, and all injected CO_2 remains 3.2 km underground in the target (Deadwood) formation. Passive seismic monitoring has also continued to show no earth movements or micro events associated with injection.

Studies took place after the work-over completion, including pulsed neutron decay logging, a tool that assists in identifying the location and concentrations of injected CO_2. This work provides important data for reservoir modelling that is ongoing at University of Alberta and Saskatchewan. Since the Deadwood formation contains sandstone with extremely high brine content (up to 30% NaCl), a study was commissioned with the University of Melbourne to examine salt precipitation in the injection well. That work is ongoing, with final results expected in 2019-20.

The drilling rig established to pull and replace the injection well tubing in May, 2018

Perhaps the best method of imaging the CO_2 plume at a depth of over 3 km is 3- and 4-dimensional seismic imaging. A seismic shoot completed in the previous fiscal year (2017-18) at 136,000 tonnes of injected CO_2 meant that another in 2018-19 was not done. PTRC expects to perform another seismic shoot in 2019-20 after injection totals surpass 250,000 tonnes.

PTRC wishes to thank SaskPower for its ongoing commitment to this project and our research has led to unprecedented international interest in Aquistore. Organizations like those already mentioned, as well as partners like Australia National Low Emissions Coal R&D (ANLEC), the Energy and Environmental Research Centre (United States), and Mosaic Potash continue to support the research. Over 115 published and peer-reviewed papers/presentations have now been disseminated globally about the project.

Project Highlights

Heavy Oil Research Network

Approved Projects 2018 - 2019

Research funded through the Heavy Oil Research Network (HORNET) at the PTRC totalled some 1.3 million dollars in 2018-19. Some of the projects approved through the request for proposals process are multi-year in nature and so not all approved funds are paid in a given fiscal period. Milestones achieved facilitate payment during the life of projects.

A technical advisory group (TAG) made up of members from the three current industry funders of HORNET (CNRL, Husky and Devon), along with representatives from Innovation Saskatchewan and the PTRC, reviewed the proposals and determined the projects going forward.

HORNET has become increasingly focused on very real critical challenges faced in the field, particularly low recovery from heavy oil deposits because of wormhole formation during cold heavy oil production with sand (CHOPS) and enhanced waterflooding that leads to breakthrough between injection and production wells. As a result, research in 2018-19 focused on improving processes like cyclic solvent injection (CSI) and the use of chemicals, polymers and surfactants during waterflooding of post-CHOPS reservoirs. Funded research also focused on processes that will reduce greenhouse gas emissions during extraction through the development of less energy intensive recovery processes.

01 Cyclic Solvent Injection (CSI) in Non-Wormholed Regions: Stage II (Saskatchewan Research Council)

This project builds on SRC's previous work with cyclic solvent injection, including experiments with carbon dioxide, methane, ethane, propane and butane at various scales and in various configurations. Wormholes (pathways and voids) created in reservoirs through CHOPS lessen oil recovery during CSI cycles by providing a continuous path for gas to flow instead of creating foamy oil. This experimental study seeks to mimic conditions in non-wormholed reservoirs in Saskatchewan and Alberta by examining flow mechanisms and the effect of pressure depletion to re-establish foamy oil flow. Various solvents will be used in the reservoir models.

Impacts of Research: Cyclic solvent injection has become an increasingly important tool for heavy oil producers in Saskatchewan and Alberta, since it increases production while also lowering the greenhouse gas emissions of operations by reducing steam and hot water use during extraction. Developing different CSI configurations reduce the amount of heat required and produce more oil than the traditional 5-8% in CHOPS reservoirs.

02 Reactions of Solvent Gases with SARA Fractions (Saskatchewan Research Council)

Foamy oil creation is perhaps the most important reaction needed in the production of heavy oil from reservoirs. Researchers carried out lab experiments using CO_2 and CH4 to find any evidence of special chemical bonding between these solvents and various components in petroleum, i.e., SARA fractions and model compounds. Research showed that Waseca saturates, aromatics and resins all significantly enhanced the CO_2 and CH4 foam. Foam from Waseca and Bakken heavy oils decayed much more quickly than that of Colony heavy oil. Additional testing is planned.

Impacts of Research: Examining the chemical reactions and conditions that enhance the production of foamy oil, particularly from certain kinds of solvents, will help reduce the amount of energy needed in heavy oil production, improve recovery rates, and activate existing suspended wells, thus reducing the need for additional wells.

03 Foamy Oil Properties Matrix for Cyclic Solvent injection Processes (Saskatchewan Research Council)

The research team at SRC created an in-house flow loop with fully automatic control and data acquisition capability to study foamy oil generation and stability. The flow loop has been utilized in this two year program to create a comprehensive dataset matrix of foamy oil properties for three gases with different scenarios in foamy oil generation and stability measurements. The objective is to create a systematic and comprehensive data matrix that will advance the understanding of foamy oil behavior to be used for modeling in the future. The ultimate goal is to determine the optimum conditions for cyclic solvent injection (CSI) processes.

Impacts of Research: If this project is able to provide knowledge of the conditions that generate foamy oil as well as the specific reasons for the behaviour of the oil, operators may stabilize and maintain the foamy phase longer to produce more from existing wells and reservoirs during CSI. This may save energy, reduce costs, and lower environmental impacts of production.

04 Chemical Enhanced Oil Recovery and Frontal Instability (Saskatchewan Research Council)

This project offers an exploration of cost-effective, non-thermal chemical recovery processes that can be applied to Canadian heavy oil fields. These processes may include the addition of thermally activated polymers during recovery, deployment of gels and colloidal gels, along with micro-emulsion and foam-based processes. The project will investigate various mechanisms of enhanced oil recovery, including conformance control and frontal Instability, wettability and geochemistry and fluid-fluid interactions.

Impacts of Research: The addition of polymers, chemicals and surfactants during waterflooding of heavy oil fields will help increase production from existing wells, thus reducing the need for additional drilling, reducing surface land disturbance, increasing the profitability of operations, and improving royalties for governments.

(Above)
The University of Alberta's industrial centrifuge is being used in a project headed up by the University of Saskatchewan

(Right)
Dr. Peng Luo uses the new industrial-scale CT-scanner in SRC projects to examine core samples. Photo courtesy of SRC

05 Wormhole Structure Characterization through Modeling and Analyzing Data during Solvent Injection Post CHOPS Processes (University of Regina)

To successfully apply solvent injection in an oilfield, understanding the mechanisms of mass transfer and how solvents distribute in heavy oil reservoirs under the influence of existing wormhole structures are both critically important. Currently, field solvent injection testing data may potentially offer the most direct and detailed information about CHOPS wells and mass transfer performance. However, very few mathematical models have been developed to study these complicated but valuable data. This project is aiming to provide novel solvent injection models of CHOPS wells with wormholes and to predict dynamic solvent distribution along wormholes.

Impacts of Research: Eventually, this research and the models produced will help optimize solvent injection processes and design/optimize production wells for better EOR outcomes. Energy use and surface impacts of drilling will also be reduced.

06 Effects of Water Saturation and Stability Agents on Foamy Oil Flow and the Cyclic Solvent Injection Process (University of Regina)

Compared with traditional solvent injection methods such as gas flooding or VAPEX, CSI processes show great enhancement of foamy oil production. Previous studies of foamy oil phase and fluid flow behavior (stability) have focused on the primary production of foamy oil without considering the effect of water saturation. To fill this gap in CSI research, both the effect of water saturation and foam stabilizer on foamy oil flow and CSI processes will be studied. The optimal foamy oil stabilizer and non-equilibrium PVT properties will be chosen as the operational scheme for bench-scale sand-pack.

Impacts of Research: Optimizing current and future configurations of CSI processes will improve recovery rates, reduce and direct the use of solvents, and allow existing wells to maximize production. The concurrent reanimation of suspended wells will also mean a reduction in the need for additional drilling and land disturbance.

07 Modelling and Experimental Measurement of Solution Gas / Solvent Dissolution and Exsolution in Heavy Oil (University of Regina)

Heavy oil has unique and distinctive foamy oil behaviors; more specifically, during isothermal depressurization tests, gas bubbles evolve out of the liquid phase and are trapped causing the observed bubble-point pressure of the system to be significantly lower than true values. This so-called “supersaturation” phenomenon is heavily influenced by several parameters such as the viscosity of the oil, temperature, the depressurization rate being utilized, etc. This project will develop an experimental methodology to fill the gaps in knowledge about the transient equilibrium of different solvents (C2, C3, CO_2 etc.) and will develop a better understanding of the impact of depressurization/pressurization rates on foamy oil stability. Comprehensive models will be developed that incorporate kinetics to describe foamy oil behavior both at equilibrium and non-equilibrium phases.

Impacts of Research: Understanding phase behaviour of foamy oil and maintaining its characteristics for as long as possible during extraction from reservoirs will allow for more oil to be produced. The models being created in this project will aid industry to prolonging foamy oil production in the field.

08 Direct Visualization of Foamy Oil Generation and Stability, Non-Equilibrium Phase Behavior, and Solvent Mass Transfer of CO_2 and CO_2+HC Solvent(s)/Heavy Oil Systems (University of Regina)

In solvent injection processes, examining fluid non-equilibrium phase behavior and the efficacy of solvent mass transfer are necessary to decide a proper operational scheme. In previous studies, most of the non-equilibrium phase behavior and solvent mass transfer studies looking at solvent injection were carried out in non-observable or hardly-observable equipment. In this project, in order to observe the instantaneous foamy-oil nature of solvent-heavy oil systems, highly visible, high-pressure 2-dimensional cells will be built and tested to attain direct observation capability and to thoroughly investigate different types of solvent-heavy oil systems.

Impacts of Research: This project will develop a state-of-the-art high-pressure visual cell combined with a micro-model to observe in real time the direct formation of foamy oil and most of the conditions and variables that go into optimizing solvent injection processes. Such observations may lead directly to optimization of solvent injection in the field and improvements in heavy oil recovery.

09 Effects of Porous Medium and Pressure Draw-down on Foamy Oil Flow and Heavy Oil Recovery in CHOPS Reservoirs (University of Regina)

This project aims to study non-equilibrium foamy-oil flow and total heavy oil recovery in a CHOPS reservoir. The ultimate objective is to identify the best CSI process with the strongest and longest foamy oil flow for use in Canadian post-CHOPS reservoirs. Tasks include selecting a CHOPS well owned and operated by one of the PTRC industry sponsors and to collect and characterize the produced heavy oil and brine samples. Three pure solvents (C1, C3 and CO_2) as well as three mixtures of these solvents will be chosen by the industry sponsors. A second well's oil may also be tested to study the "dead oil viscosity effect".

Impacts of Research: Eventually this research will lead to the best CSI technology and its operating conditions being directly applied and evaluated in a field pilot test by one of the PTRC's industry sponsors. In this way, many heavy oil producing companies in both Saskatchewan and Alberta can use the best CSI process to effectively and economically exploit their post-CHOPS reservoirs.

10 Effects of Geomechanical Heterogeneity on Wormhole Development during Cold Heavy Oil Production with Sand – Phase 2 (Universities of Saskatchewan and Alberta)

This project will use laboratory experiments to observe wormhole development in a scaled model of a CHOPS reservoir to assess wormhole geometries and numerical modeling to enhance our understanding of geomechanical processes in reservoirs. The project includes consultation with CHOPS operators to Identify linkages between lab-testing outcomes and field-based monitoring, and builds on an earlier project that resulted in the design of a CHOPS reservoir model. The model developed at the University of Saskatchewan is being tested at the University of Alberta using its state-of-the-art geotechnical centrifuge.

Impacts of Research: The main objective of this research is to better understand the nature of wormholes and the strata in which they propagate. A better understanding of wormholes as they exist in the sandy, heavy oil reservoirs of Alberta and Saskatchewan will improve the positioning of wells. The optimal injection of solvents and water will reduce the need for additional drilling by potentially reanimating the many thousands of suspended wells in both provinces.

Tight/Light Oil Research

PTRC committed $300,000 to Saskatchewan Research Council's tight oil research, specifically its Viking Productivity Improvement program. The Viking formation in southwestern Saskatchewan contains many reservoirs that are in varying stages of depletion. The overall objective of this research program is to assist oil producers to develop cost-effective recovery techniques to maintain and improve production from this formation.

Research is being conducted into enhanced waterflooding, conformance control, improved reservoir understanding, and building effective modeling tools. The experimental work includes water compatibility and coreless injectivity evaluation, chemical screening, custom core flood experiments, reservoir characterization, and fracture modeling. The project uses state-of-the-art light and tight research instruments, including an ultra-high-speed centrifuge and an industrial-scale, dual-tube computed tomography (CT) scanner that PTRC and SRC purchased with funding in part acquired from Western Economic Diversification.

INDEPENDENT AUDITORS' REPORT

To the Members,
Petroleum Technology Research Centre Inc.

Opinion
The summary financial statements, which comprise the summary statement of financial position as at March 31, 2019, the summary statements of operations, unrestricted net assets and cash flows for the year then ended, and related notes, are derived from the audited financial statements of **Petroleum Technology Research Centre** for the year ended March 31, 2019.

In our opinion, the accompanying summary financial statements are a fair summary of the audited financial statements, which were prepared in accordance with Canadian accounting standards for not-for-profit organizations.

Summary Financial Statements
The summary financial statements do not contain all the disclosures required by Canadian accounting standards for not-for-profit organizations. Reading the summary financial statements and the auditor's report thereon, therefore, is not a substitute for reading the audited financial statement and the auditor's report thereon.

The Audited Financial Statements and Our Report Thereon
We expressed an unmodified audit opinion on the audited financial statements in our report dates July 25, 2019.

Management's Responsibility for the Summary Financial Statements
Management is responsible for the preparation of the summary financial statements based on the audited financial statements prepared in accordance with Canadian accounting standards for not-for-profit organizations.

Auditor's Responsibility
Our responsibility is to express an opinion on whether the summary financial statements are a fair summary of the audited financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standard (CAS) 810, Engagements to Report on Summary Financial Statements.

July 25, 2019
Regina, Saskatchewan

VIRTUS GROUP LLP
Chartered Professional Accountants

Petroleum Technology Research Centre Inc.
Condensed Consolidated Statement of Financial Position
For the Year Ended March 31, 2019

(C$000s)	2019	2018
Assets		
Cash	$ 6,033	$ 6,509
Other Assets	299	1,103
Total Assets	6,332	7,612
Liabilities and net assets		
Deferred revenue	3,644	3,822
Other liabilities	176	1,128
Total liabilities	3,820	4,950
Net assets	2,512	2,662
Total liabilities and net assets	$ 6,332	$ 7,612

Petroleum Technology Research Centre Inc.
Condensed Consolidated Statement of Operations and Unrestricted Net Assets
For the Year Ended March 31, 2019

(C$00s)	2019	2018
Revenue recognized		
Government of Saskatchewan funding	$ 1,823	$ 1,556
Government of Canada funding	20	824
Industry funding	1,489	2,070
Other funding	249	162
Total revenue recognized	3,581	4,612
Expenses		
Projects	2,744	3,811
Operations	987	869
Total expenses	3,731	4,680
Excess of revenue (expense)	(150)	(68)
Unrestricted net assets, beginning of year	2,662	2,730
Unrestricted net assets, end of year	$ 2,512	$ 2,662

Petroleum Technology Research Centre Inc.
Condensed Consolidated Statement of Cash Flows
For the Year Ended March 31, 2019

(C$000s)	2019	2018
Net cash from operating activities	($ 458)	$ 378
Net cash used in investing activities	(18)	(7)
Increase in cash	(476)	366
Cash, beginning of year	6,509	6,143
Cash, end of year	$ 6,033	$ 6,509

Summary Financial Statements

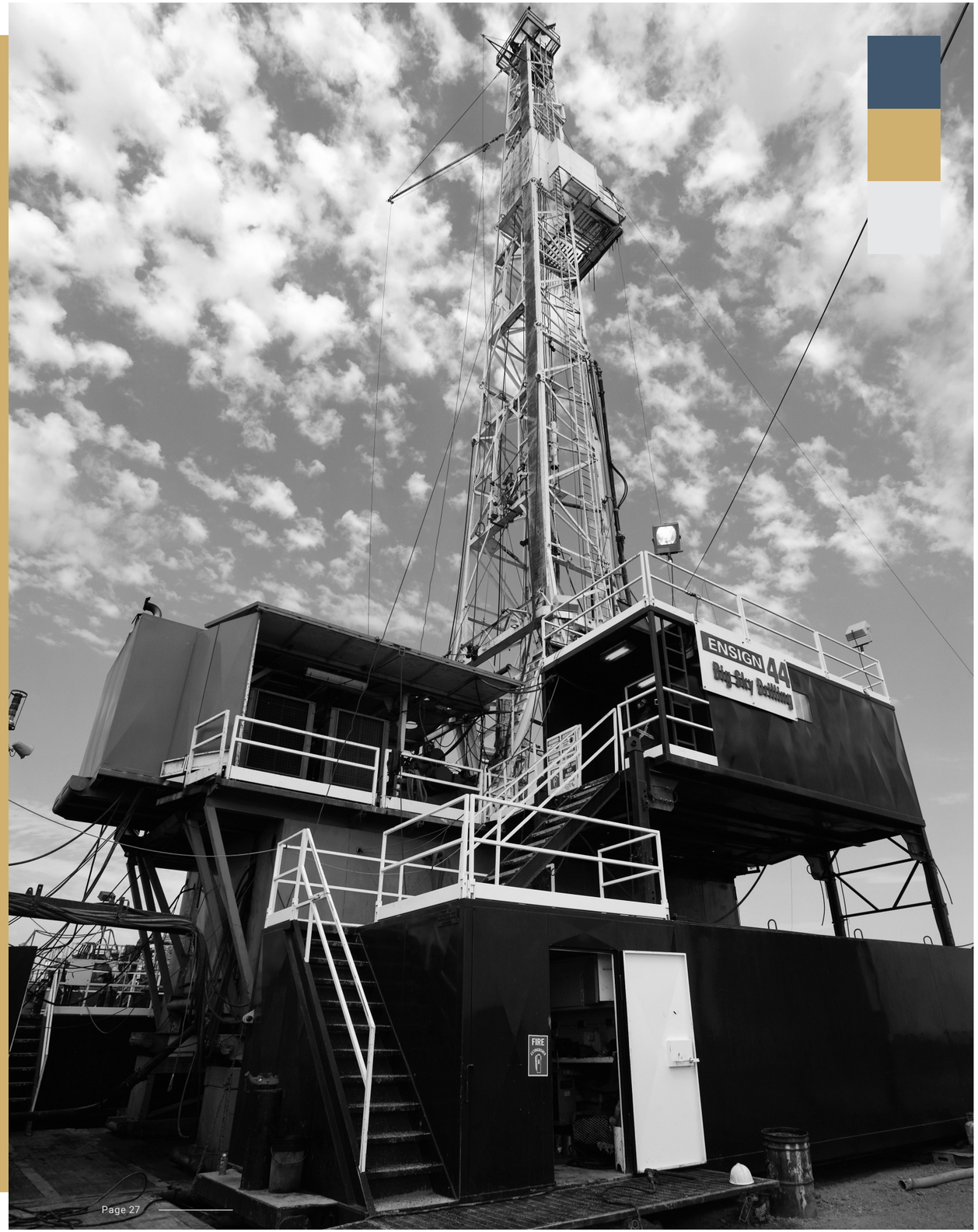
The summary financial statements are derived from the audited financial statements, prepared in accordance with Canadian accounting standards for not-for-profit organizations, as at March 31, 2019 and for the year then ended.

The preparation of these financial statements requires management to determine the information that needs to be reflected in them so that they are consistent in all material respects with, or represent a fair summary of, the audited financial statements.

Management prepared these summary financial statements using the following criteria:

(a) The summary financial statements include a statement for each statement included in the audited financial statements;
(b) Information in the summary financial statements agrees with the related information in the audited financial statements;
(c) Major subtotals, totals and comparative information from the audited financial statements are included; and
(d) The summary financial statements contain the information from the audited financial statements dealing with matters having a pervasive or otherwise significant effect on the summary financial statements.

The audited financial statements of Petroleum Technology Research Inc. are available upon request by contacting the organization.



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