

OSTRF - News

OIL SANDS TAILINGS RESEARCH FACILITY

MAY 2004



Departments

Civil
& Environmental
Engineering

Renewable Resources

Chemical
& Materials
Engineering

OSTRF MEMBERS



Oil Sands Tailings Research Finds a Home

The University of Alberta has spearheaded the establishment of an off-campus Oil Sands Tailings Research Facility (OSTRF) at the Devon Research Centre, in Devon, Alberta, Canada.

This has been made possible with contributions of leased space shared by Alberta Research Council (ARC) and the federal government's CANMET Energy Technology Centre (CETC)-Devon. Construction and operational funding has come from generous contributions from the Canadian Foundation for Innovation (CFI), Alberta Science and Research Investment Program (ASRIP), Natural Resources Canada, and from the oil sands industry: Suncor, Syncrude, Albian Sands, Canadian Natural, and TrueNorth.

Research funding from Suncor, Syncrude, Albian Sands and Canadian Natural has been pledged for

the next five years to support tailings research.

The OSTRF is a unique academic and industrial research facility. It has a three-pronged mandate: to develop novel and innovative approaches for oil sands tailings

treatment, to attract world-class students and researchers; and to train significant pools of highly qualified scientists, engineers and technicians who will become the next generation of oil sands industry leaders.



The Devon Research Centre, Devon, Alberta

Graduate Students Key to Success

Graduate students at both the Master's and Ph.D. level, as well as post-doctoral fellows, will carry out research in the new facility, which is housed in the Devon Research Centre.

Students will receive co-supervisory support from the University of Alberta, and federal scientists, as well as access to advanced research equipment.

Five students have already been

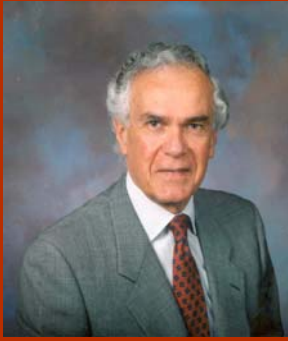
placed under the umbrella of the OSTRF, prior to full operations beginning in Fall 2004. (See page 3.)

Students are encouraged to apply for graduate studies starting September 2004. Student inquiries can be directed to:

Dr. D.C. Sego
University of Alberta
dave.sego@ualberta.ca
(780) 492-2059



Silawat Jeevaripoolvam, M.Sc. Student, evaluates Creep Compression of Mature Fine Tailings in 10 m high columns. (See page 3.)



Dr. Norbert Morgenstern
Chair
OSTRF Management
Committee

“I’ve been impressed by the cooperative efforts made by many different stakeholders to see the OSTRF turn from a vision into reality.”

COACH’S CORNER

The Oil Sands Tailings Research Facility (OSTRF) initiative grew out of different visions articulated in 1999.

The University of Alberta (U of A) had noted a decline in the numbers of students researching mine waste at the Masters and Ph.D. level, and the OSTRF was an initiative intended to reverse that trend. The U of A was proposing to refurbish a Quonset at the University Research Farm located on the south end of Edmonton.

At the same time, the CANMET Energy Technology Centre in Devon, Alberta (20 km SW of Edmonton) was proposing to expand its tailings research capability. CETC is part of the federal government’s Department of Natural Resources Canada. CETC-Devon occupies part of the Devon Research Centre, which is owned by Alberta Infrastructure.

The Canadian Oil Sands Network for Research and Development (CONRAD) Tailings Group promoted the unification of the two separate visions. An under-utilized space in the Devon Research Centre, shared by CETC-Devon and Alberta Research Council (ARC) has been donated as in-kind contributions.

I’ve been impressed by the cooperative efforts made by many different stakeholders to see the OSTRF turn from a vision into reality at the official opening on October 1, 2004.

WHY STUDY TAILINGS?

The material leftover after the bitumen is removed from the oil sands is called tailings. Tailings are a mixture of water, sand, silt, clay particles, and a small percentage of unrecovered hydrocarbons. The sand settles out relatively quickly to form solid deposits. The clays and silts run off into the contained settling pond to form fine tailings.

The challenge in managing fine tailings comes from its huge volumes, fluid character, and its long consolidation time. For every barrel of oil that is produced, approximately 1 m³ of coarse sand tailings and 0.25 m³ of fine tailings are created. Currently, hundreds of millions of cubic metres of fine tailings are stored in large settling ponds in Alberta, see photo below. It is estimated

that natural consolidation to a solid material would take hundreds, if not thousands, of years.

Cumulative land disturbance projected for current and planned oil sands activities will have a footprint of about 45,000 hectares within 25 years. Tailings research is crucial to ensure sustainability, meet environmental regulations and reduce operating costs.



Image of oil sands region, May 2003 (courtesy of Syncrude).

What’s Up?

- ◆ Jan 27, 2004: Alberta Energy Utility Board (AEUB) approves CNRL-Horizon project
- ◆ Feb 5, 2004: AEUB approves Shell expansion (Jack Pine Project.)
- ◆ May 10-12, 2004: Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Conference in Edmonton, Alberta (OSTRF session on Tuesday, May 11, 10:30 - 12:00 in Room 8)
- ◆ Oct 1, 2004: Official OSTRF opening in conjunction with the new University of Alberta Markin/CNRL Natural Resources Engineering Facility (NRES)
- ◆ Visit our web site at www.ostrf.com

STUDENT FOCUS

Five students began graduate course work in 2003, under the umbrella of the OSTRF, independent of the construction of the facility:

Junwen Yang, Ph.D. student, with completion expected in 2005. Funded by Suncor. *“CFD Modeling of Oil Sands Tailings Slurries”*

Eric Niven, M.Sc. Student, with tailings research to begin April 2004. NSERC Industrial Postgraduate Scholarship. Partially funded by Syncrude. *“Densification of Beach Below Water Tailings”*

Silawat Jeevaripoolvam, M.Sc. student, completion expected in 2004. Funded by Suncor. *“Creep Compression, A Novel Approach To Settlement of Tailings Slurries”*

Michelle Laimun Chang, M.Sc. student, completion expected in 2006. Funded by AERI COURSE program and Syncrude. *“Recovery of Commercial Kaolin from Oil Sands Tailings”*

Student Research Opportunities

For September 2004.

Funding to support NSERC Industrial Postgraduate Scholarship in place. *“Foamed Tailings”*

CIM Presentations

Monday, May 10 14:00 Room 9

14:00 *Introduction to the OSTRF* Dave Sego

Tuesday, May 11 10:30 - 11:30 Room 8

10:30 *“Response of Dense Beach Above Water Tailings to Cyclic Equipment Loading at Syncrude’s Southwest Sand Storage Facility”* Renata Wood

10:45 *“Effect of Biological Gas Generation on Oil Sand Fine Tailings”* Chengmai Guo

11:00 *“Simulation of Deposition of Sand into Mature Fine Tails (MFT) Using computational Fluid Dynamics Method”* Junwen Yang

11:15 *“Settlement of Tailings Slurries by Creep Compression”* Silawat Jeevaripoolvam

VISION OF THE OSTRF

Limited progress with respect to improved tailings management is recognized as an impediment to future success of the oil sands industry. The OSTRF will provide crucial infrastructure for research opportunities at the intermediate scale that is not presently available for university research in Canada, compared to the current bench-and full-scale research efforts.

The Facility’s initial research program will study the next generation of oil sands tailings development, and undertake research into management of the existing massive inventories of tailings. Activities at the Facility are intended

to improve the multi-disciplinary aspects of the research, and to ensure that graduate student-focused research will be industrially relevant, well planned and well conducted.

The OSTRF will be designed to provide maximum research flexibility. The infrastructure will consist of three independent modules for delivery, treatment and deposition of tailings. Each module will contain interchangeable units, skid-mounted with self-contained instrumentation. The Facility is an intermediate-scale continuous flow-through facility, designed to accommodate a number of concurrent research projects. Operations at either

600 kg/hr or 2000 kg/hr will be possible.

Common research themes, crucial to the growth of the oil sands industry have emerged from industry think-tanks. These include:

- ◆ Improved reclamation strategies and techniques
- ◆ Efficient use of water
- ◆ Sustainable landscape/less reliance on fluid retaining structures
- ◆ Material handling techniques that minimize environmental impact.
- ◆ Mitigation of adverse environmental releases

Silawat Jeevaripoolvam has been working with Dr. J.

Don Scott and Dr. Rick Chalaturnyk from the Department of Civil & Environmental Engineering, at the University of Alberta, on settlement of tailings slurries by creep compression.

“Analytical predictions of the rate and magnitude of settlement of deposited oil sands tailings slurries generally overestimate how fast pore

pressures will dissipate. Field deposits of nonsegregating tailings to mature fine tailings show continued high pore pressures near the surface which impede surface reclamation.

A new large strain consolidation model which assumes that the creep rate of the slurry exceeds the pore pressure dissipation rate is being investigated. This drainage path increases by several metres a year such as in oil sand tailings ponds and CT deposits. The model will be verified by analyzing the 10 m high column of mature fine tails at the University of Alberta, which has been monitored for over 20 years and in which the excess pore pressures are still very high.”

- from the abstract for CIM Edmonton 2004



Funding Commitments



Construction and Infrastructure Funding: \$2.25M

- ◆ Alberta Science and Research Investment Program (ASRIP) - \$500K (Provincial)
- ◆ Canada Foundation for Innovation (CFI) - \$800K (Federal)
- ◆ Natural Resources Canada Capital Projects Fund - \$700K (Federal)
- ◆ Oil Sands Industry (Suncor, Syncrude, Albion Sands, Canadian Natural, TrueNorth) at \$50K each - \$250K

Funding for Research (Cash Commitments): \$200K x 5 years

- ◆ Oil Sands Industry (Suncor, Syncrude, Albion Sands, Canadian Natural) at \$50K each for 5 years

Facility Lease: \$80K each year

- ◆ Alberta Research Council - \$40K each year
- ◆ Natural Resources Canada - \$40K each year

Funding for Operation: \$240K

- ◆ Canada Foundation for Innovation (CFI) - \$240K

In-Kind Contributions: \$405K

- ◆ Alberta Research Council - \$60K
- ◆ Natural Resources Canada - \$85K
- ◆ Oil Sands Industry (Suncor, Syncrude, Albion Sands, Canadian Natural) - \$200K total each year
- ◆ University of Alberta - \$60K



Leased space being cleaned out in preparation for construction activities (January, 2004).

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Mandate of the OSTRF:

- To develop novel approaches for tailings treatment, to reduce their volume, and to improve their physical characteristics to assist in the development of cost-effective, environmentally superior post-depositional restoration.
- To attract world-class researchers and students to undertake projects at the facility.
- To train significant pools of highly qualified scientists and engineers who will become the next generation of oil sands industry leaders, consultants and regulators.
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Team Commitments

The OSTRF has three levels of responsibility: The Management Committee sets the long-term research strategy and directions. It approves the recommended research priorities submitted by the Scientific Committee, approves the operating budget, and is responsible for securing ongoing funding. The Scientific Committee is responsible for developing a yearly research program, and evaluating and recommending research proposals and a budget to the Management Committee. The Design Team is responsible for developing a preliminary as well as a detailed design of the OSTRF, equipment requirements for each module, cost estimates, construction schedule, and ensure safety and environmental concerns and requirements are met. The Design Team makes its recommendations to the Management and Scientific Committees.

The Management Committee:

Norbert Morgenstern: Chair, U of A
Dave Sego: U of A
Ross Chow: Alberta Research Council
Rob Birkholz: Albion Sands Energy
Joy Romero: Canadian Natural
Hassan Hamza: Natural Resources Canada

Doug Kennedy: Suncor Energy Inc.
Ted Lord: Syncrude Canada

The Scientific Committee: (main delegates)

Dave Sego: Principal Investigator, U of A
David Chanasyk: U of A
Nancy Su: Alberta Research Council
Jim Blum: Albion Sands Energy, Inc.
Tom Dereniwski: Canadian Natural
Randy Mikula: Natural Resources Canada
Paul Chawrun: Suncor Energy Inc.
Jonathan Matthews: Syncrude Canada

The Infrastructure Design Team:

Dave Sego: Principal Investigator, U of A
Trevor Peter: Alberta Infrastructure
Ed Siminoski: Alberta Infrastructure
Kelvin Yau: Alberta Research Council
Vince Wallwork: Canadian Natural
Johnny Chow: Natural Resources Canada
Khalid Hashmi: Natural Resources Canada
Kanti Kar: Natural Resources Canada
Roman Zrobok: Natural Resources Canada
Ted Lord: Syncrude Canada
George Cymerman: Syncrude Canada