Presentation to the HUTF

Gasification Chair at The University of Saskatchewan

Business Plan Presented by

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Overview of Plan

- Background
- Research Drivers
- Vision Statement
- The Business Advantage
- Proposed research program
- Budget
- Outcomes/deliverables

Background

- 2004: $240 K donation by Nexen for fluidized bed membrane gasifier development
- 2006: Letter of Intent to establish a research chair in gasification approved by U of S JCCP
- 2007: PTAC workshop re chairs at U of S and U of C on hydrogen/gasification

Research Drivers

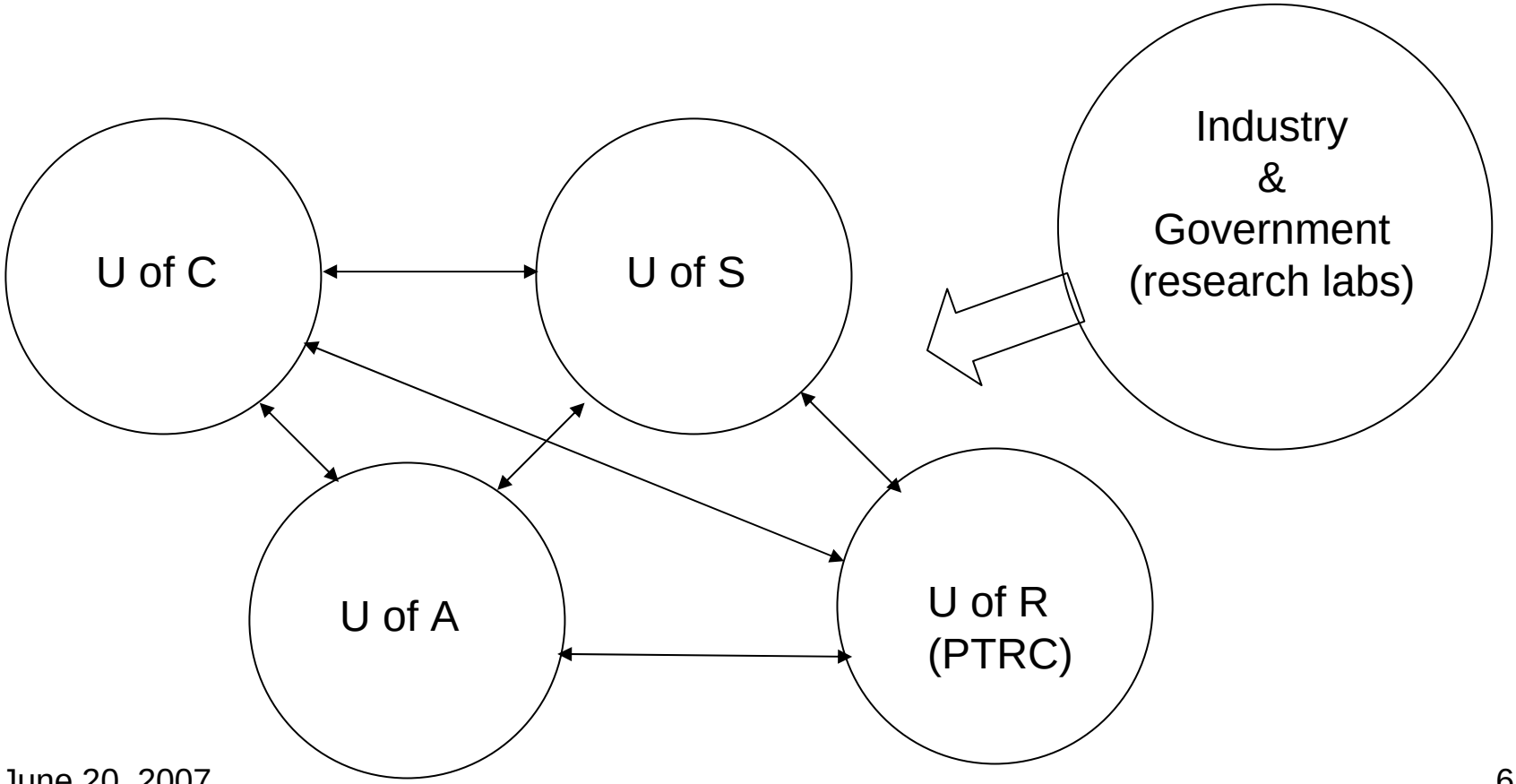
- Hydrogen production for oil sands upgrading
- Efficient utilization of Western Canadian liquid and solid fuels (coal, petcoke, asphaltenes)
- Value-added chemicals from these feeds
- Environmental concerns/regulations
- Economics and reliability of gasification

Vision – U of S Chair

We will build on our internationally recognized *fluidized bed research program* to become the preeminent academic research laboratory for *fluidized bed gasification*. Our focus will be on *Western Canadian gasification feedstocks, including asphaltenes, coal, and petroleum coke,* and through *fundamental and applied research,* we will *improve the economics and reliability* of fluidized bed gasification technology.

Vision

A Western Canadian research network



The Business Advantage

- At U of S we are world leaders in fluidized bed hydrodynamics and reaction kinetics
- Combine this with catalysis research at U of C, oil sands upgrading/coal research at U of A, and CO_2 sequestration at PTRC
- A Western Canadian network with an industry advisory board; focused on gasification, hydrogen production/systems, and CO_2 capture
- Such a network presently does not exist in Canada

The U of S Advantage

- Fluidization Laboratory of Saskatchewan (FLASK)
  - $1.6 million dollar CFI project
  - Pilot and lab scale fluidized beds
  - Particle characterization equipment
  - Pilot plant space among the finest in Western Canada

a few photos...

The U of S Advantage

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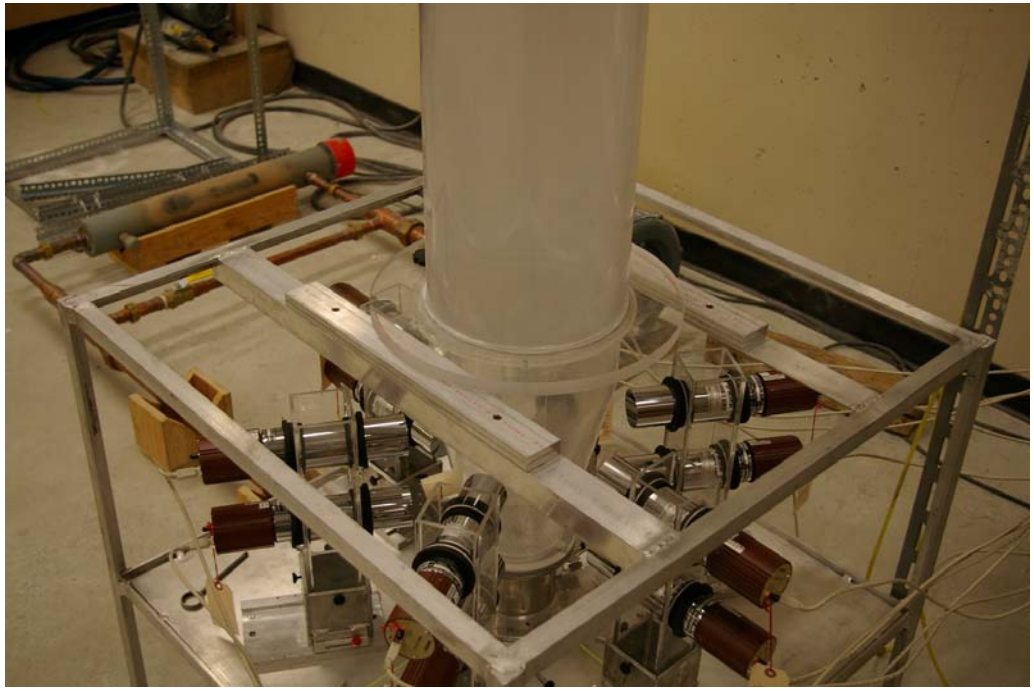


The U of S Advantage

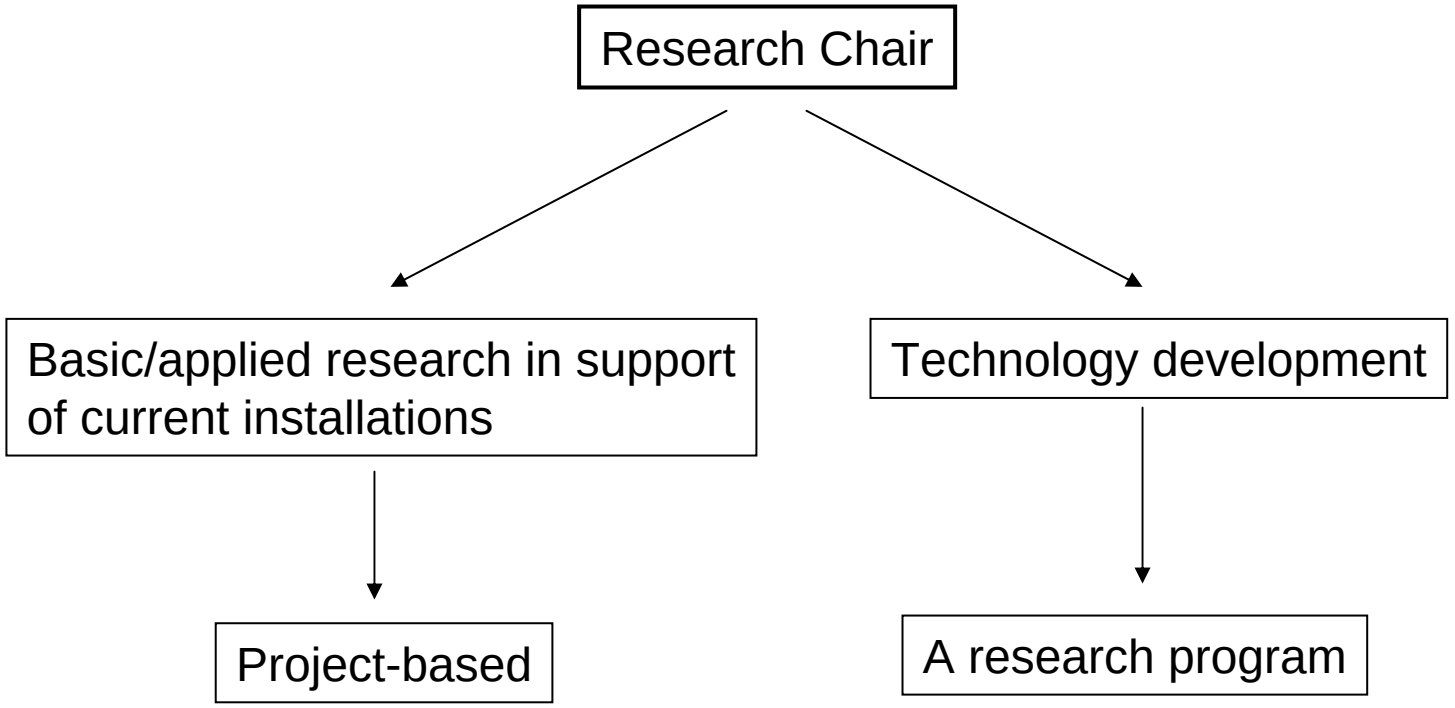
- Bench-top, fixed bed gasification kinetics
- Fuel analysis
  - CHNS, calorific value
- Particle characterization
  - Size distribution, shape, density
- Nozzle characterization
  - Spray imaging using particle size analyzer

The U of S Advantage

- A history of success working with industry:
  - Total; SaskPower; KBR; Nexen; Syncrude
  - Solutia
  - Merck Frosst; Eli Lilly
  - Philom Bios
- Work together to identify research needs
- Regular progress reports and meetings
- Goals and milestones consistently met

Proposed Research Program

- Two research paths envisioned



Proposed Research Program

- Short term (next 5 years)
  - Fluidized bed gasification of asphaltenes
  - *In-situ* removal of hydrogen using semi-permeable membranes
- Medium term (5 to 10 years)
  - Transport (circulating fluidized bed) gasification of lignite and asphaltenes
- Long term (10 to 20 years)
  - Demonstration plant to commercialization

Outcomes/Deliverables

- Development of a fluidized bed membrane gasifier – catalytic??
- Hydrodynamic studies and mathematical modeling of pressurized entrained flow gasifier
- Leveraging of results and industrial support of chair to build a demonstration plant – SDTC or similar
- HQP Training; Western Canada expertise

Budget

- Salary + benefits for chair holder: $100K to $150K per year
- Salary, benefits, operating costs of graduate students and research assistant: $100 K to $150 K per year
- Total budget = $200K to $300 K per year
- Duration of program – 5 years, renewable

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