



# CHEMICALS AND PETROLEUM OVERVIEW



# SNC-Lavalin

- Founded in 1911
- World class engineering & construction firm
- Ranked by ENR among Top 10 Global Design Firms
- Some 21,000 employees executing projects in more than 100 countries
- Permanent offices in more than 30 countries
- Annual revenues 2008: CA\$ 7.1 B
- Listed on the Toronto Stock Exchange



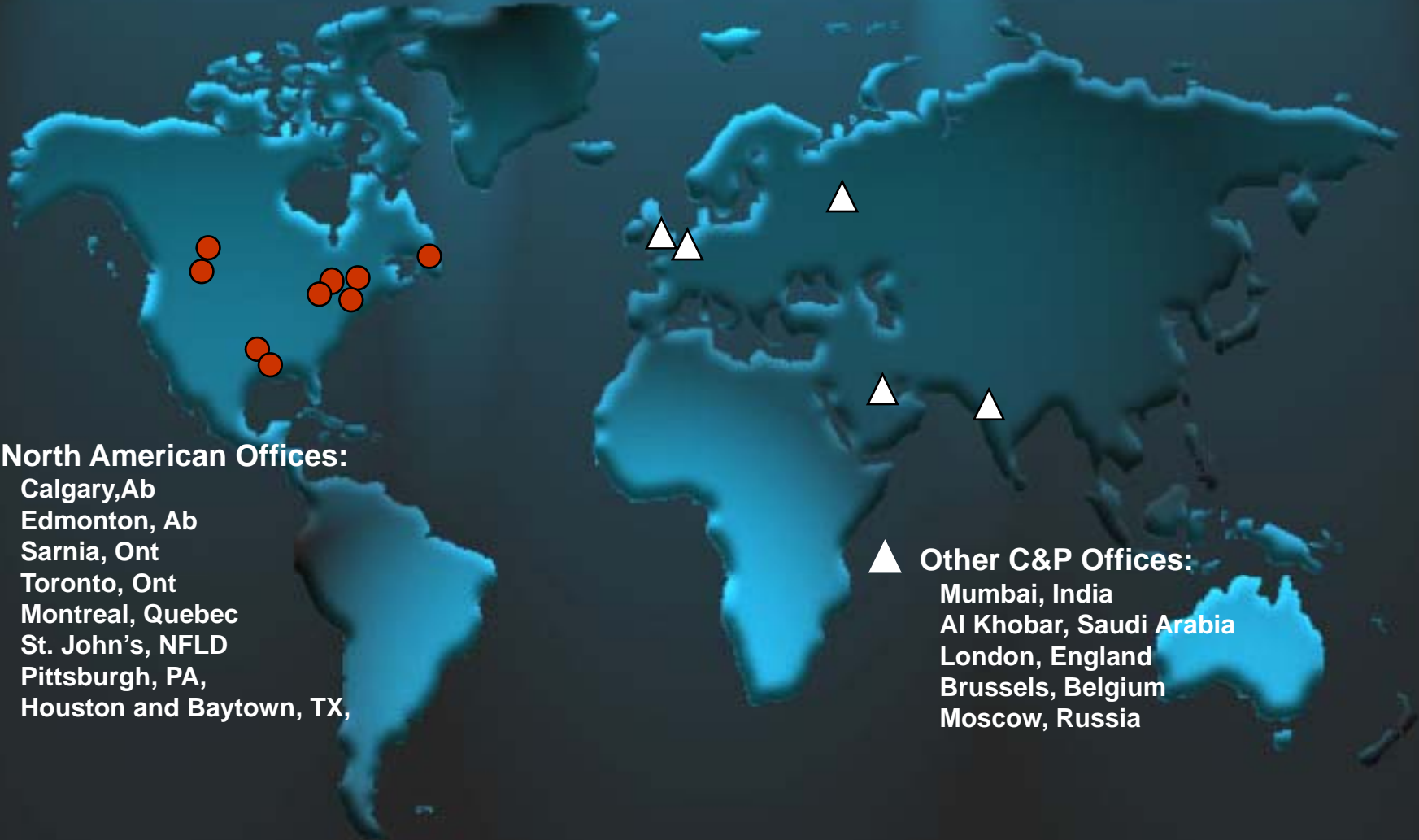
# CHEMICALS AND PETROLEUM OFFICES

● **North American Offices:**

Calgary, Ab  
Edmonton, Ab  
Sarnia, Ont  
Toronto, Ont  
Montreal, Quebec  
St. John's, NFLD  
Pittsburgh, PA,  
Houston and Baytown, TX,

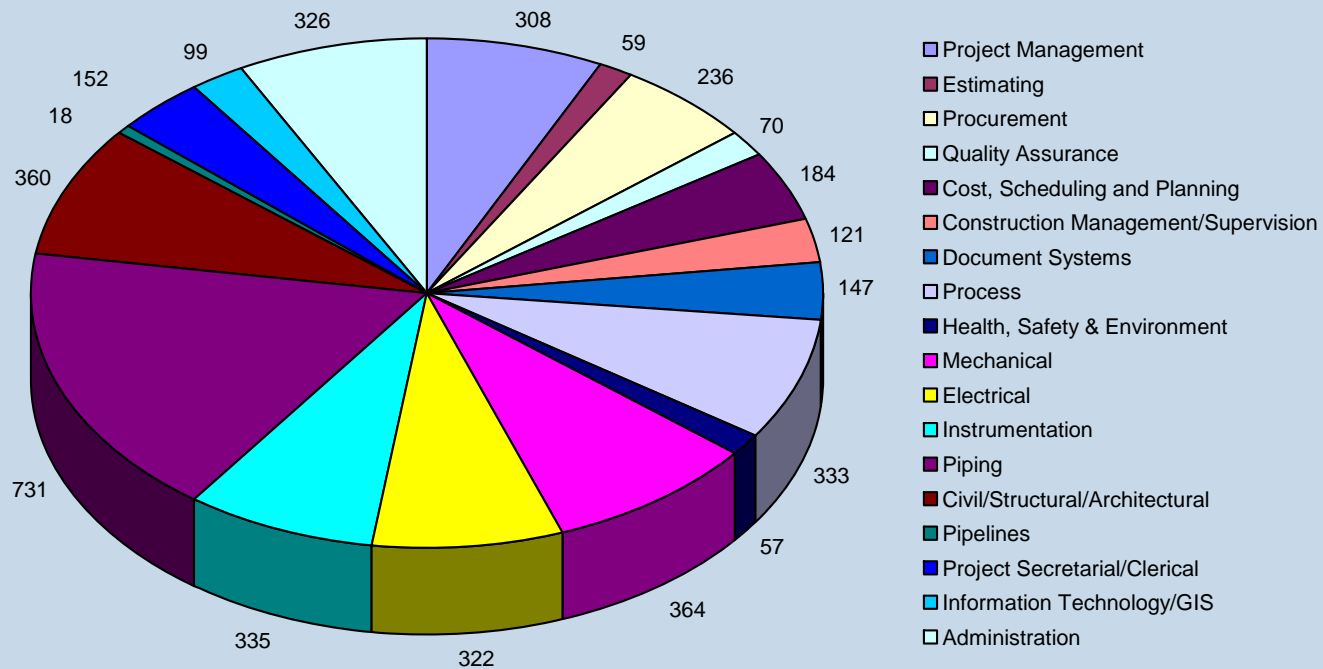
▲ **Other C&P Offices:**

Mumbai, India  
Al Khobar, Saudi Arabia  
London, England  
Brussels, Belgium  
Moscow, Russia



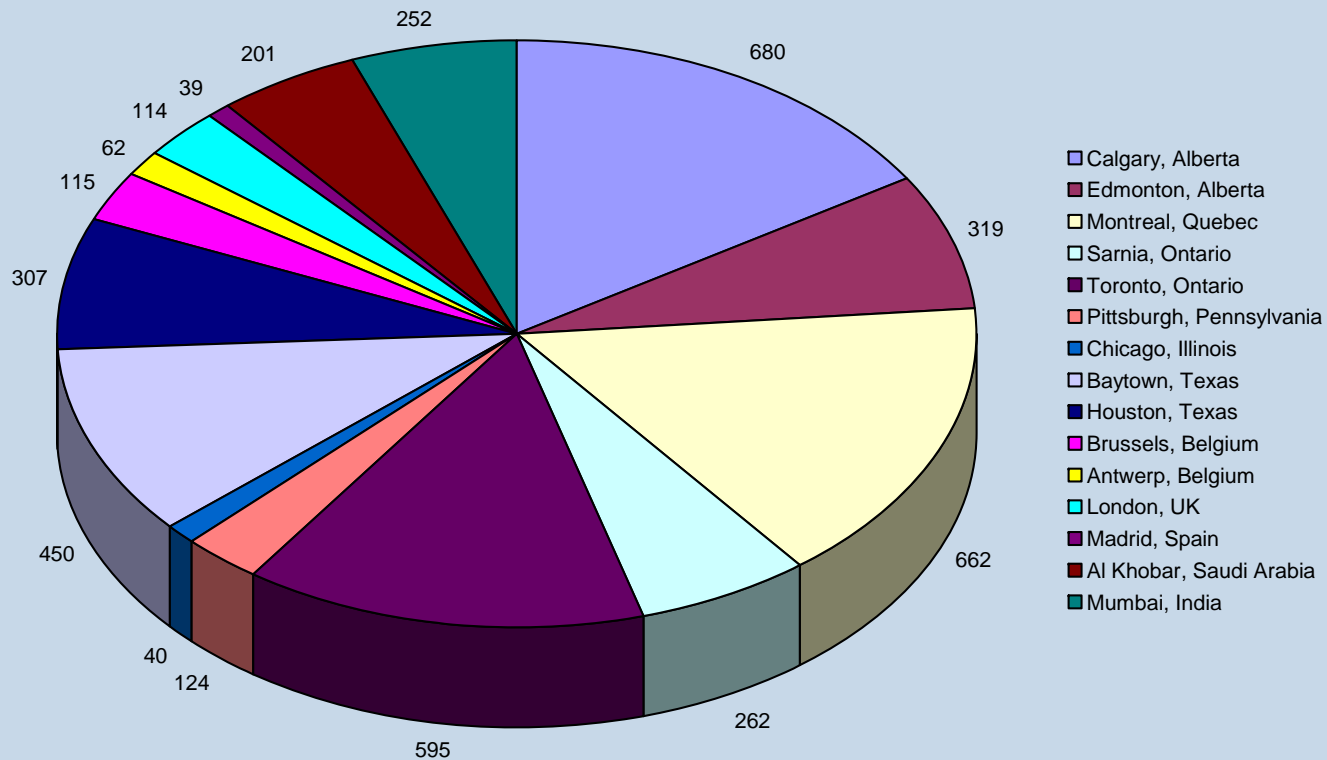
# GLOBAL C&P RESOURCE STRENGTH BY DISCIPLINE (February 2009)

Global Strength by Discipline  
February 2009 - Total 4,222



# GLOBAL C&P RESOURCE STRENGTH BY LOCATION (February 2009)

Global Resources by Location  
February 2009 - Total 4,222



# EXPERTISE

Upstream:	<ul style="list-style-type: none"><li>• Oil and gas production and treating facilities</li><li>• Gathering systems and field facilities</li><li>• Bitumen production - oil sands and in situ</li></ul>
Midstream:	<ul style="list-style-type: none"><li>• Pipelines</li><li>• Gas processing, LNG</li><li>• GTL, CTL, CTG - gasification</li><li>• Heavy oil / bitumen upgrading</li></ul>
Downstream:	<ul style="list-style-type: none"><li>• Refining – green field, brown field and revamps</li><li>• Petrochemical plants, Fertilizers</li><li>• Ethanol</li></ul>



# SERVICES

- Conceptual Studies
- Pilot Plants (Performance Specifications, Design and Operation)
- Feasibility studies (DBM / EDS / FEED)
- Full EPCm / EPC services
- Lump Sum Turnkey Projects (LS / LSTK / CLSTK)
- Project Managing Contractor
- Financing, Insurance, Equity, BOOT



# SNC-LAVALIN C&P STRENGTHS

- Major and mega project experience worldwide
- Knowledge of local clients specs and standards
- Flexible contracting strategies
- EPC lump sum experience
- Expert Systems, tools and procedures
- Engineering resources
- Financial depth and capability
- Cost-effective multi-office capability

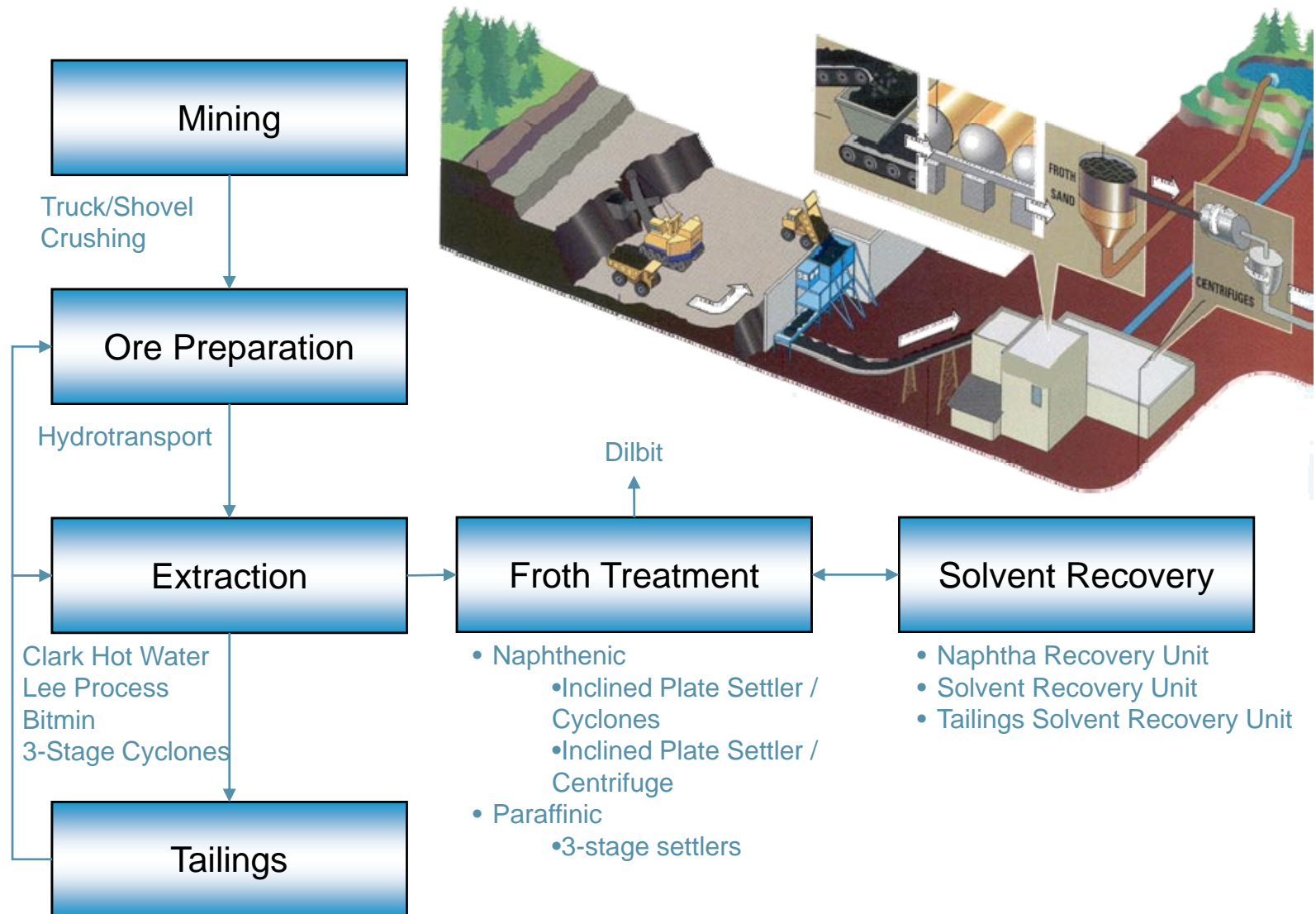




# MINEABLE ENERGY



# TYPICAL MINING METHODS



# CURRENT OIL SANDS EXPERIENCE

- Canadian National Resources Ltd. (CNRL)
  - Prepared alternative Flotation flowsheet options
  - Demonstration Plant
  - Scoping study, DBM, EDS and Detailed Design for Froth Treatment Facility (270,000 bpd)
  - Evaluation of proposed tailings thickener design
- Fort Hills Energy Corporation
  - Conceptual flowsheets and cost estimates for greenfield oil sands mining and extraction facility
  - Pilot plant design and construction
- Joslyn North (Total E&P) – earlier Deer Creek
  - Process modelling for solvent recovery
  - Handling of non-segregated tailing



# MILLENNIUM EXPANSION PROJECT SUNCOR ENERGY INC.



- Capital Cost : \$3.7 billion
- Completion: 2002 (269,000 BPD)
- Services: EP for bitumen production
- Grass Roots Process Units:
  - rotary breakers
  - slurry conditioning
  - separation vessels
  - flotation cells
  - static deaeration
  - froth treatment plant
  - cyclone cleaning



# HORIZON OIL SANDS PROJECT - FROTH TREATMENT

## Canadian Natural Resources Limited



- Location: Alberta, Canada
- Capital Cost: CA \$300 million
- Services/Completion:
  - DBM: 2003
  - EDS: 2004
  - EP&CMR: in progress
- Capacity: 232,000 BPD SCO (synthetic crude oil)
- Description: Grass roots froth treatment plant designed to treat 1,200 TPH of bitumen in froth

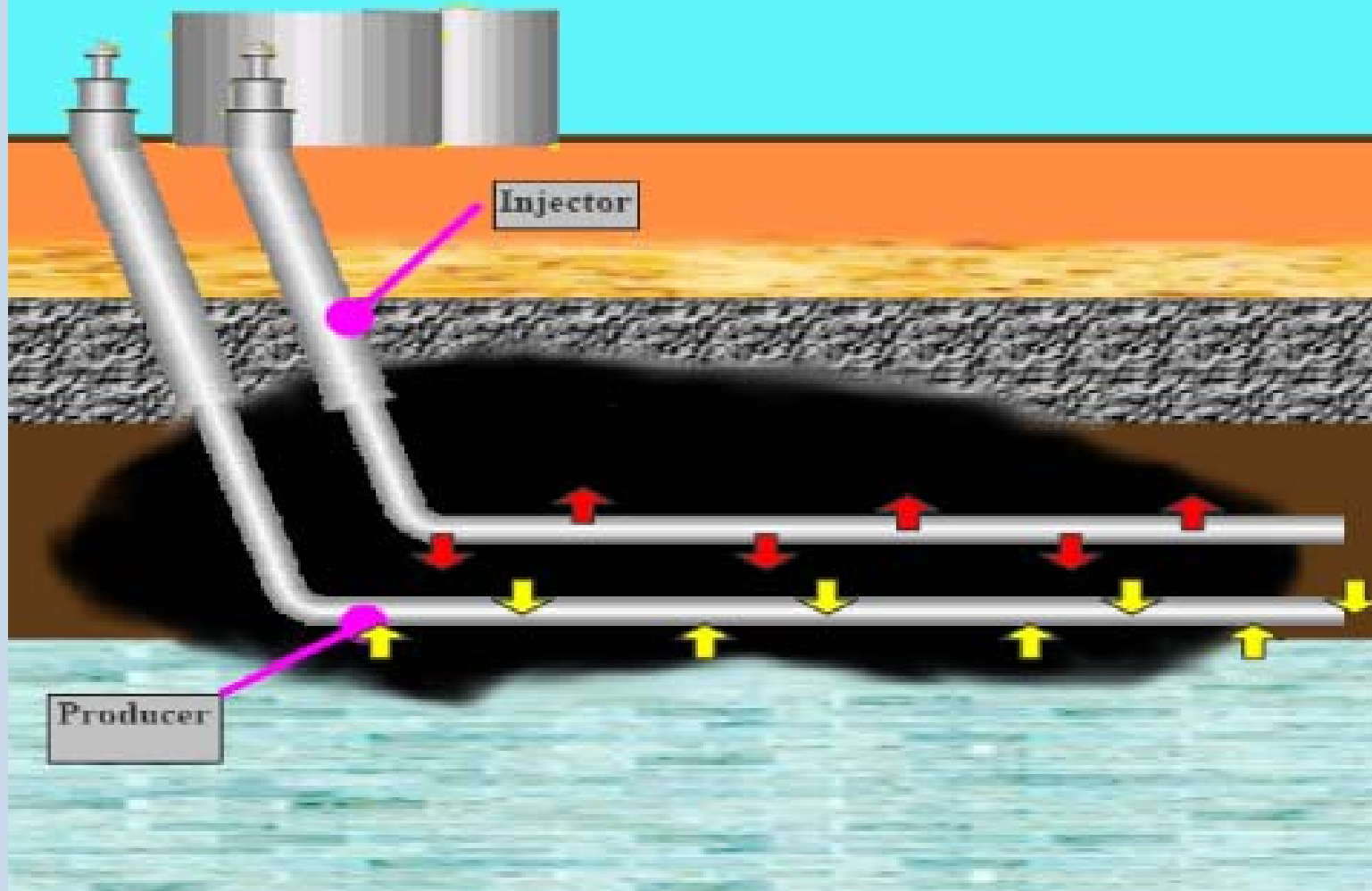




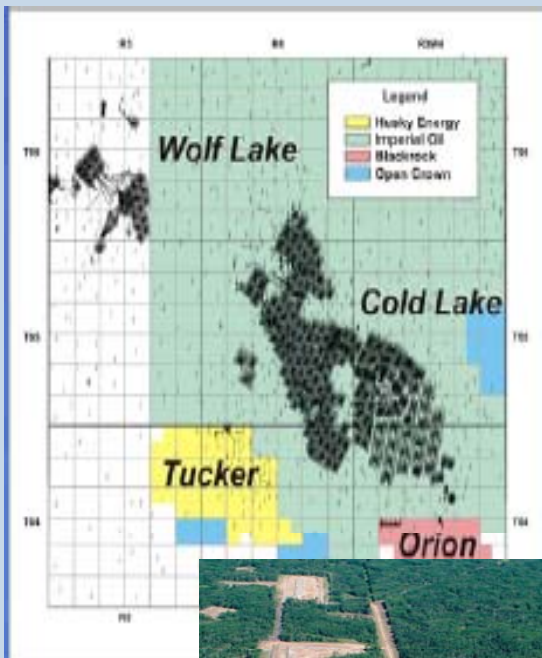
# STEAM ASSISTED GRAVITY DRAINAGE (SAGD)



# STEAM ASSISTED GRAVITY DRAINAGE (SAGD) PROCESS



# HUSKY ENERGY - TUCKER LAKE EPC

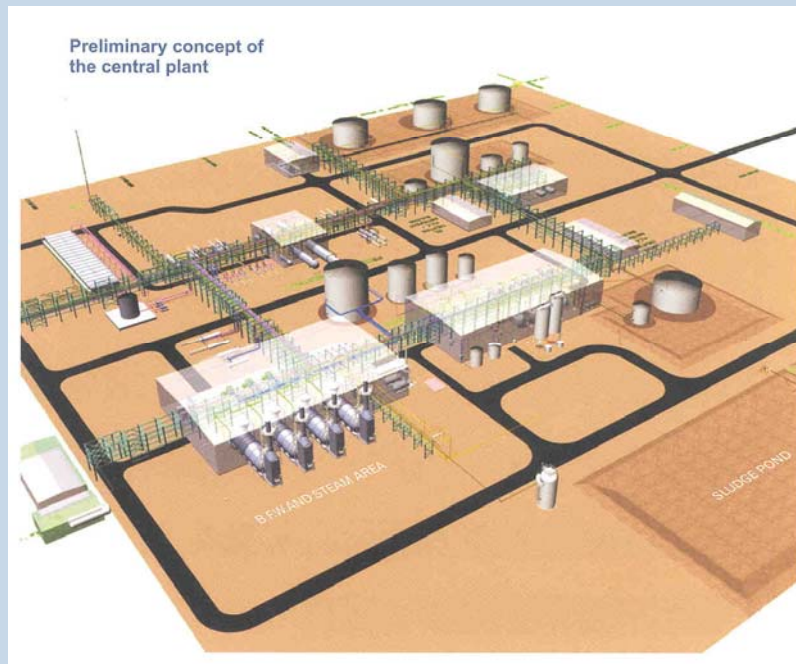


- Location: Alberta, Canada
- Capital Cost: CA \$290 million
- Capacity: 30-35,000 bpd
- Completion: 2006
- Services: EPC LS (JV with PCL)
- Description: SAGD Grass roots facility
  - Production treatment
  - Production storage
  - Oil removal unit
  - Water treatment unit including: WLS, After filter and WAC (weak acid cation unit)
  - Lime sludge storage pond
  - Steam generation (OTSG's)
  - Utilities



# HUSKY SUNRISE SAGD PROJECT

## Husky Oil Operations



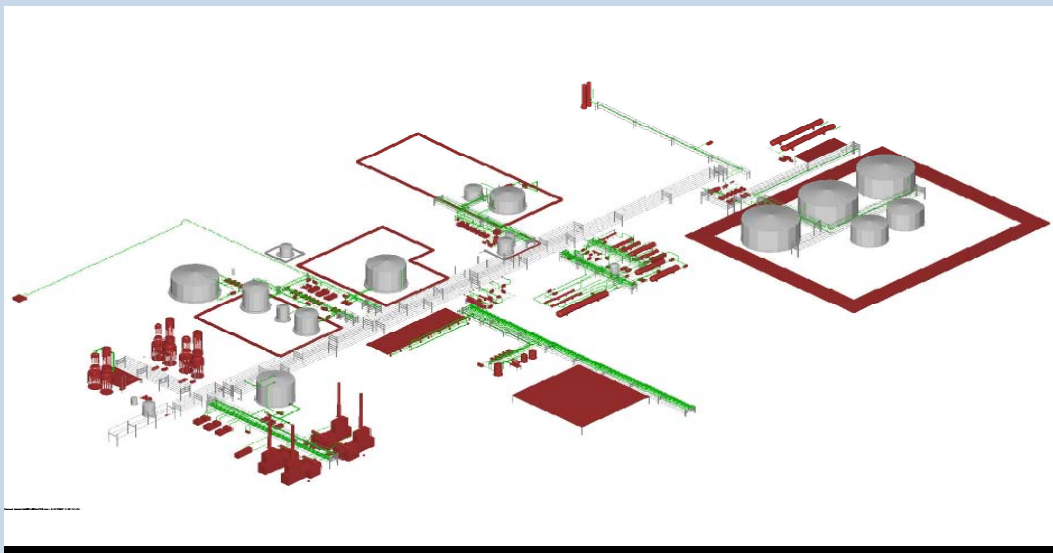
- Location: Alberta, Canada
- Capital Cost: CA \$1 Billion +
- Capacity: 60,000 to 200,000 BPD
- Completion: ongoing
- Services: Studies, DBM (FEL2), FEED (FEL3)
- Description: Field facilities/well pads, infrastructure/utilities, Central Plant



# CANADIAN NATURAL RESOURCES LIMITED

## KIRBY THERMAL PROJECT

### Canadian Natural



- Location: Alberta, Canada
- Capital Cost: CA +\$600 million
- Capacity: 30,000 bpd
- Completion: July 2007
- Services: Conceptual, DBM
- Description:
  - SAGD – examine 30,000 bpd expandable to 60,000 bpd, batteries, OTSG, pipelines, water treatment, evaporators



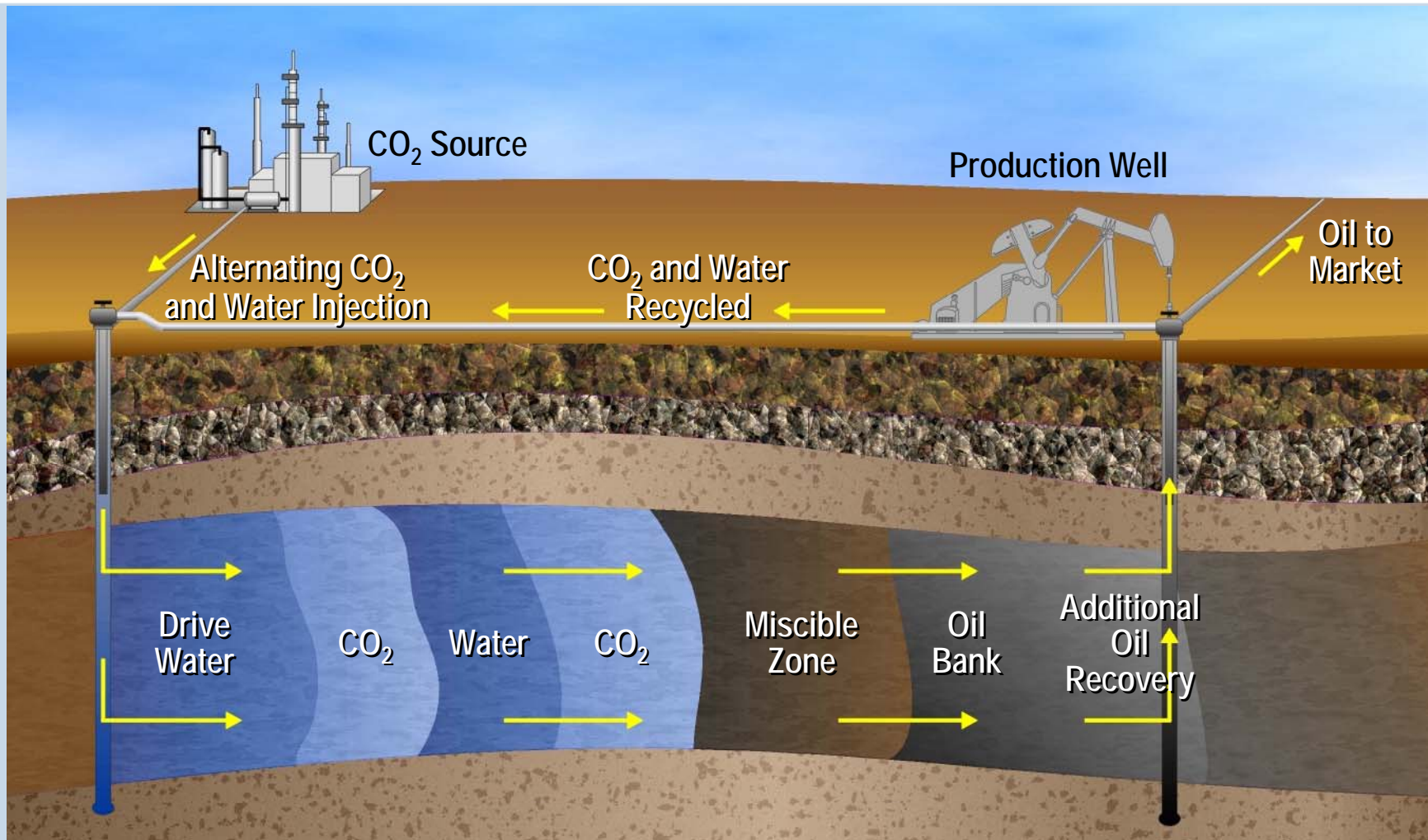


# CARBON CAPTURE AND SEQUESTRATION



# CCS FOR EOR

## Enhanced Oil Recovery

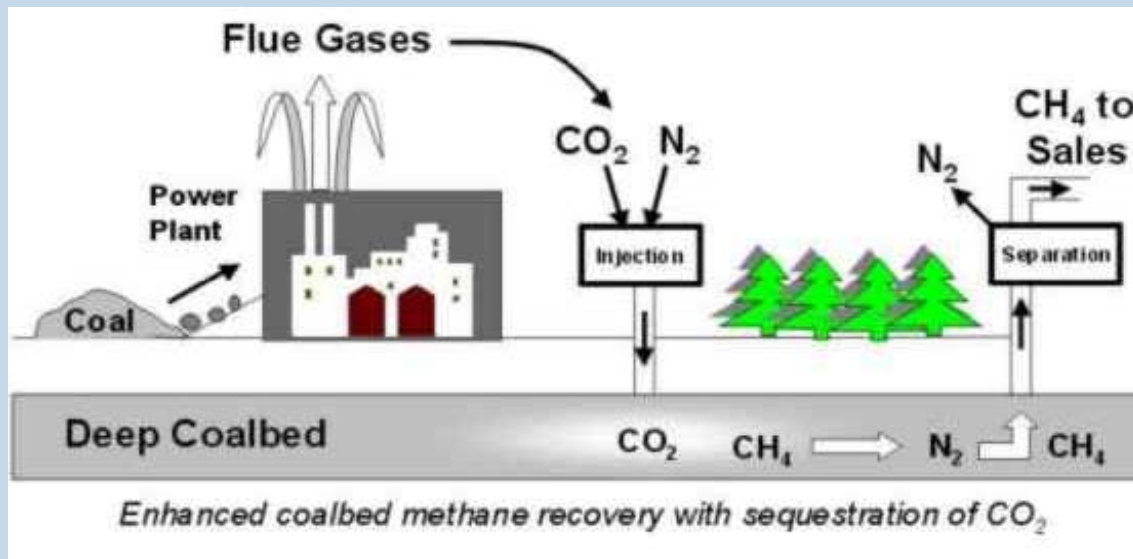


*CO<sub>2</sub> mixes with oil much like turpentine cleans paint from a brush*



# ENHANCED COAL BED METHANE RECOVERY (ECBM)

- ECBM CONCEPT DEFINITION
- Coal Bed Methane Production:
- Natural gas containing virtually 100% methane produced from coal seam reservoirs at depths ranging from 300m to 1000m, with significant volumes of water.



## Enhanced Coal Bed Methane Recovery:

Simultaneous gas injection into coal seam and coal bed methane production.  $\text{CO}_2$  injection most attractive option.



# SNC-LAVALIN EXPERIENCE:

## Studies:

- Alberta Research Council 2000
- Computer Model (capture, transport, sequester, ECBM Production)
- Canadian Energy Research Institute (CERI) 2002
  - Studies capture costs from seven kinds of sources
  - Transportation and Injection
- Canadian Clean Power Coalition (CCPC) 2003 CO<sub>2</sub> transportation and injection; sequestration options evaluation



# SNC-LAVALIN EXPERIENCE: Cont'd

## Studies:

- Enbridge Use of CO<sub>2</sub> as bitumen diluent for long distance pipeline
- IEA 2004 co-capture, transport, sequester CO<sub>2</sub> +other impurities
- ADNOC 2004 CO<sub>2</sub> capture from refinery; use in EOR
- ADNOC 2007 CO<sub>2</sub> capture from acid gas, use in EOR
- Energy Inet 2007 Atomic energy study – evaluate CO<sub>2</sub> mitigation alternatives
- CIDA CUCBM 2007 CO<sub>2</sub> capture, transport, use in ECBM in China; 4 locations
- MASDAR (ADFEC) – 2 MMTPA CCS, Abu Dhabi



# RESEARCH / TECHNOLOGY PROVIDERS SLI HAS WORKED WITH:

- Alberta Research Council
- Mitsubishi Heavy Ind. (amine capture technology)
- Vikor (original CO<sub>2</sub> EOR project and reservoir engineering)
- Sproule (International; use of CO<sub>2</sub> for EOR and ECBM)





# PIPELINES



# TYPES OF PIPELINE SYSTEMS

- SNC-Lavalin's design experience includes all types of pipeline systems:
  - Oil and gas gathering systems
  - Oil transmission
  - Gas transmission
  - Multi-product pipelines
  - Water transmission
  - Water disposal systems
  - Liquid sulphur pipelines
  - Slurries



# CORRIDOR PIPELINE LIMITED



- Location: Alberta, Canada
- Capital Cost: CA \$100 million
- Capacity: 40,000 m<sup>3</sup>/d diluted bitumen
- Completion: 2003
- Services: EPCM
- Description:
  - Pump station facilities portion of the Corridor Pipeline Project

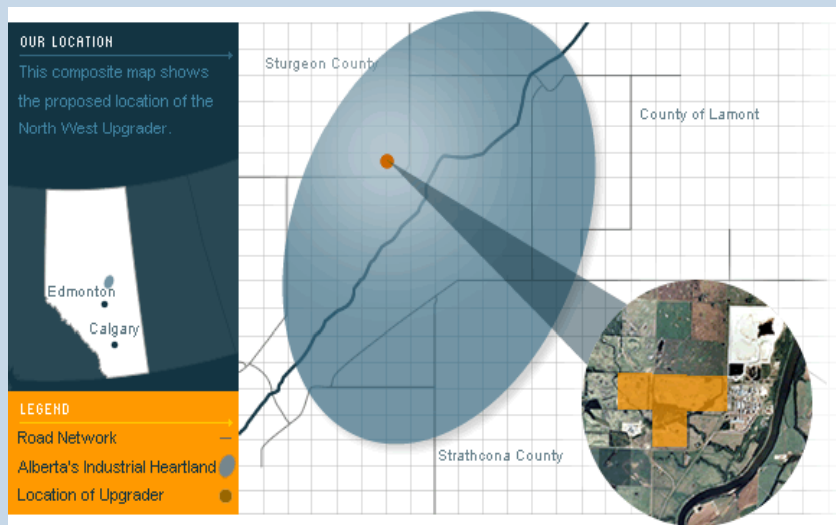




# UPGRADING AND REFINING EXPERIENCE



# NORTH WEST BITUMEN UPGRADER



- Location: Alberta, Canada
- Capital Cost: CA \$2.95 billion
- Completion: ongoing
- Services: DBM / EDS / EPC / MC
- Capacity: 50,000 BPSD Phase 1
- Grass Roots Process Units:
  - Crude / vacuum
  - Hydrocracking,
  - hydrotreating
  - Sulphur
  - Gasification
  - Light ends recovery
  - Sour Water Stripping
  - Amine Absorption
  - Utilities and offsites



# HORIZON OIL SANDS PROJECT SECONDARY UPGRADING (SUG)

## Canadian Natural Resources Limited

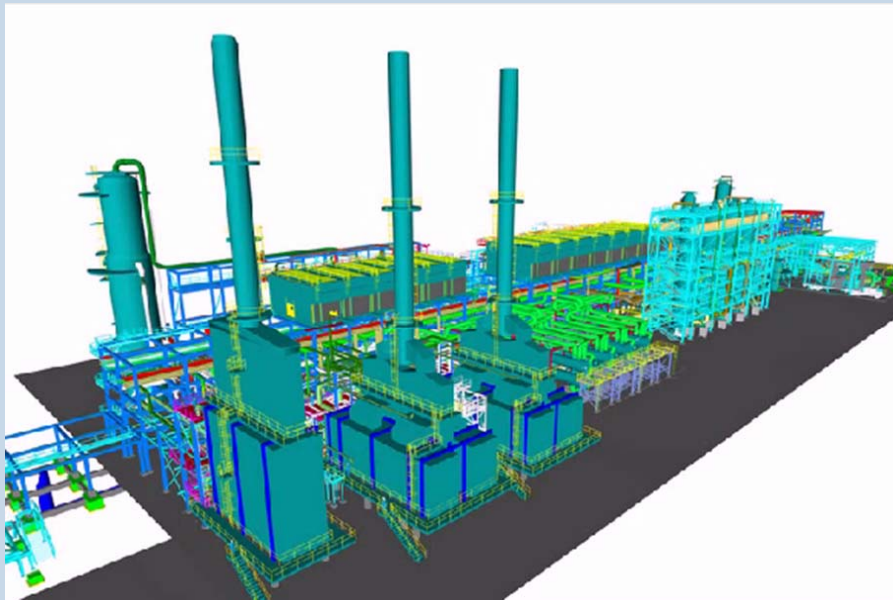


- Location: Alberta, Canada
- Capital Cost: CA \$550 million
- Capacity: 135,000 BPD
- Completion: 2008
- Services: EPC LS (JV Snamprogetti)
- Description: Secondary Upgrader consisting of 3 hydrotreaters:
  - Naphtha hydrotreater, Unit 41 - 33,000 BPSD
  - Distillate hydrotreater, Unit 42 - 48,850 BPSD
  - Gas oil hydrotreater, Unit 43 - 42,400 BPSD



# FORT HILLS SECONDARY UPGRADING PROJECT

## Fort Hills Energy LP.



- Location: Sturgeon County, Alberta, Canada
- Capacity: 170,000 BPD
- Completion: Work Suspended 1 Qtr 2009
- Services: FEED, Detailed Eng
- Description:
  - Naphtha hydrotreater
  - Medium gas oil hydrotreater
  - Interconnecting piping.



# DESULPHURIZATION PROJECTS - SIG, SIG MODS, INFRASTRUCTURE

## Petro-Canada



- Location: Alberta, Canada
- Capital Cost: CA \$600 million
- Capacity: 31,400 BPD
- Completion: 2004
- Services: EPC (JV)
- Description:
  - UOP gasoline / diesel Cat FEED hydrotreater unit (sulphur to 50 ppm)
  - Tank farm relocation
  - Infrastructure



# SYNCRUDE UE-1

## Major Expansion

- ◆ **Location: Alberta, Canada**
- ◆ **Capital Cost: \$7.4 billion**
- ◆ **Completion: Q2 2006**
- ◆ **Services: DBM, FEED, EP (JV)**
- ◆ **Other Expansions**
  - DBII – 2000
  - DBI – 1997
  - CAP - 1987

