

Industrial Big Biogas Plant Design and Construction in North America

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Canadian Farm and Food Biogas Conference, London, Ontario
March 12, 2009

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Engineering Office, Planning and Construction of Biogas Plants

Founded: 1999

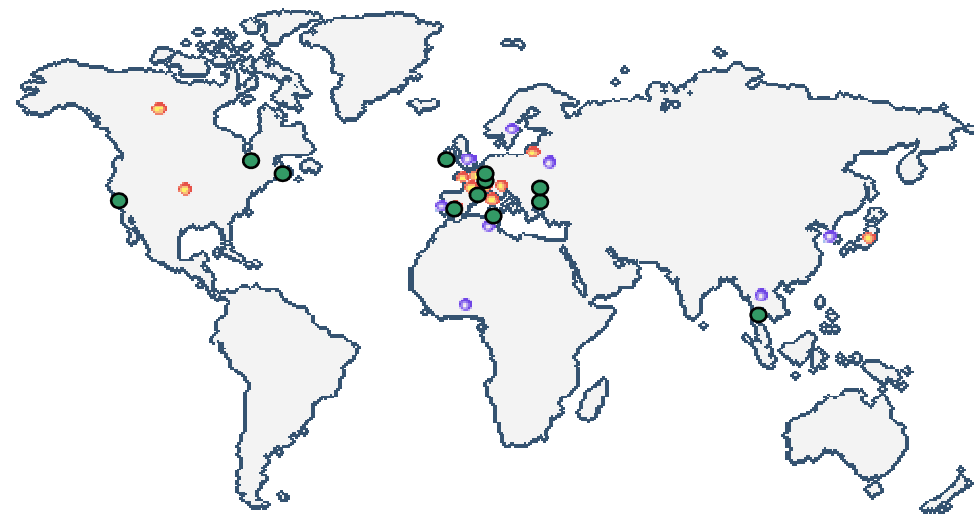
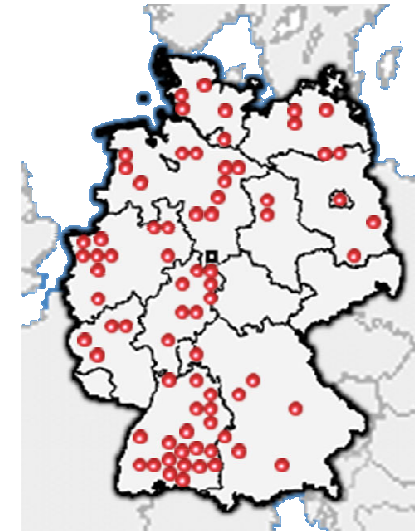
Team: 20

Experience: > 20 years

References: ca. 140 biogas plants

in: Germany, Japan, Netherlands, Austria, Switzerland,
Lithuania, Italy, Slovakia, Canada, USA, Spain, France

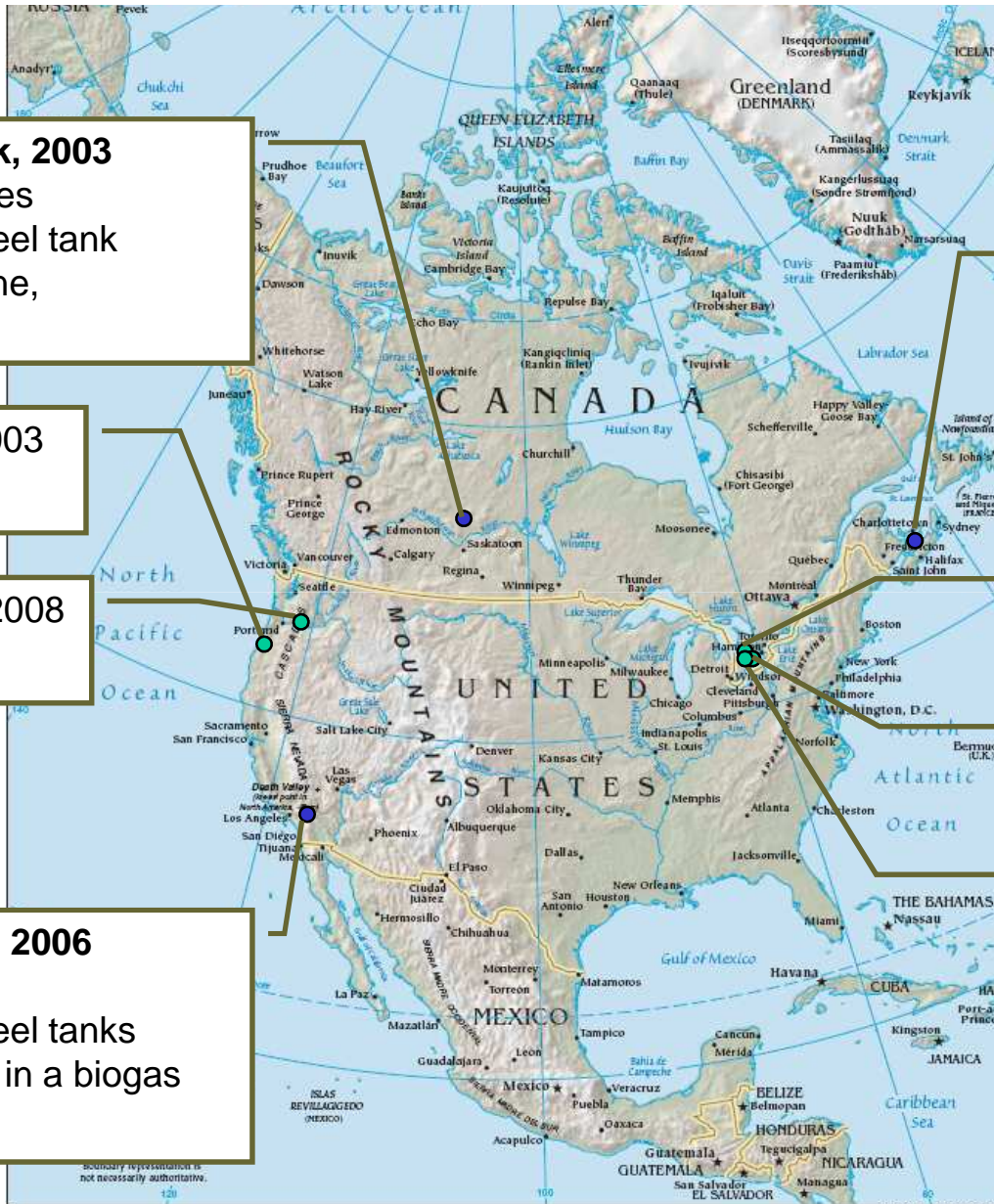
Partners: Japan, Korea,
USA, Canada,
Bulgaria, France, Hungary,
Turkey, Poland,
Spain, Ireland



Activities of Krieg & Fischer in North America



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Cudworth Pork, 2003
 manure, potatoes
 1 x 2,000 m³ steel tank
 micro gas turbine,
 4 x 30 kW

Myrtle Point, 2003
 Pre-planning

Cedar Grove, 2008
 Pre-planning

Inland Empire, 2006
 manure, waste
 2 x 4,500 m³ steel tanks
 gas distribution in a biogas
 grid

Irving Equipment, 2008
 potato residues, oil, potato
 starch
 4 x 5,500 m³ steel tanks

Toronto 2001
 Pre-planning

SF Listowel
 In Planning

SF London
 In Planning

Sakatoon, Saskatchewan, Canada



- built: 2003
- substrate: pig manure, potatoes
- digester: 2,000 m³, steel tank
- CHP: 4 x 30 kW_e microgasturbines
- designed for low outside temperature
 - special design: gas holder in a tank (left tank)
 - special building material for gas holder roof and insulation

Chino, California, USA



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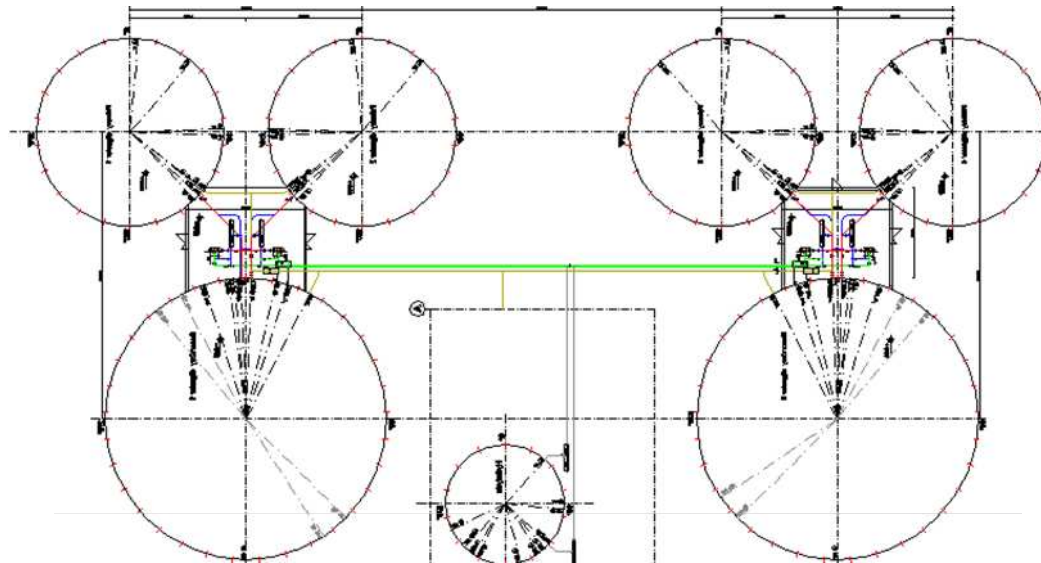


- substrate: cattle manure (270 tons/year, DM 12%), liquid waste from food industry (83 tons/year) food waste
- sediment removal from the digester
- gas distribution in a biogas grid, expected gas production 18.813 m³ per day
- expected power generation capacity: 1,500 kW_e
- construction costs: \$ 5 million

Kensington, Prince Edward Island, Canada



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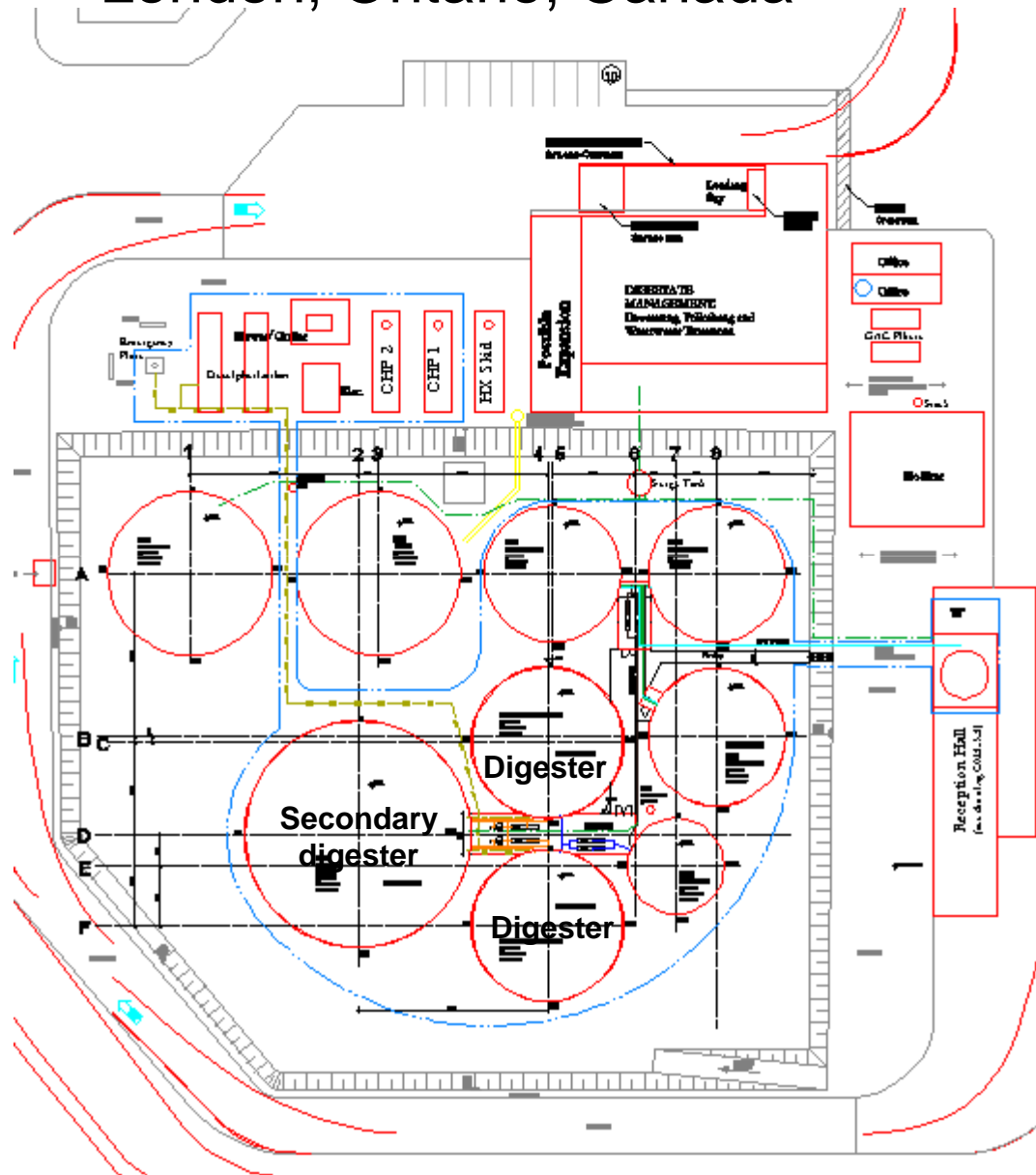


- built: 2008
- preliminary laboratory tests 2007
- substrate: potato residues, oil, potato starch
- digester: 4 x 5,500 m³, steel tank
- size: 12 MW_{th}
- 2 stage digestion with hydrolysis, 2 secondary digesters with gas holder roof
- biogas is used for heating purposes – hot water production

London, Ontario, Canada



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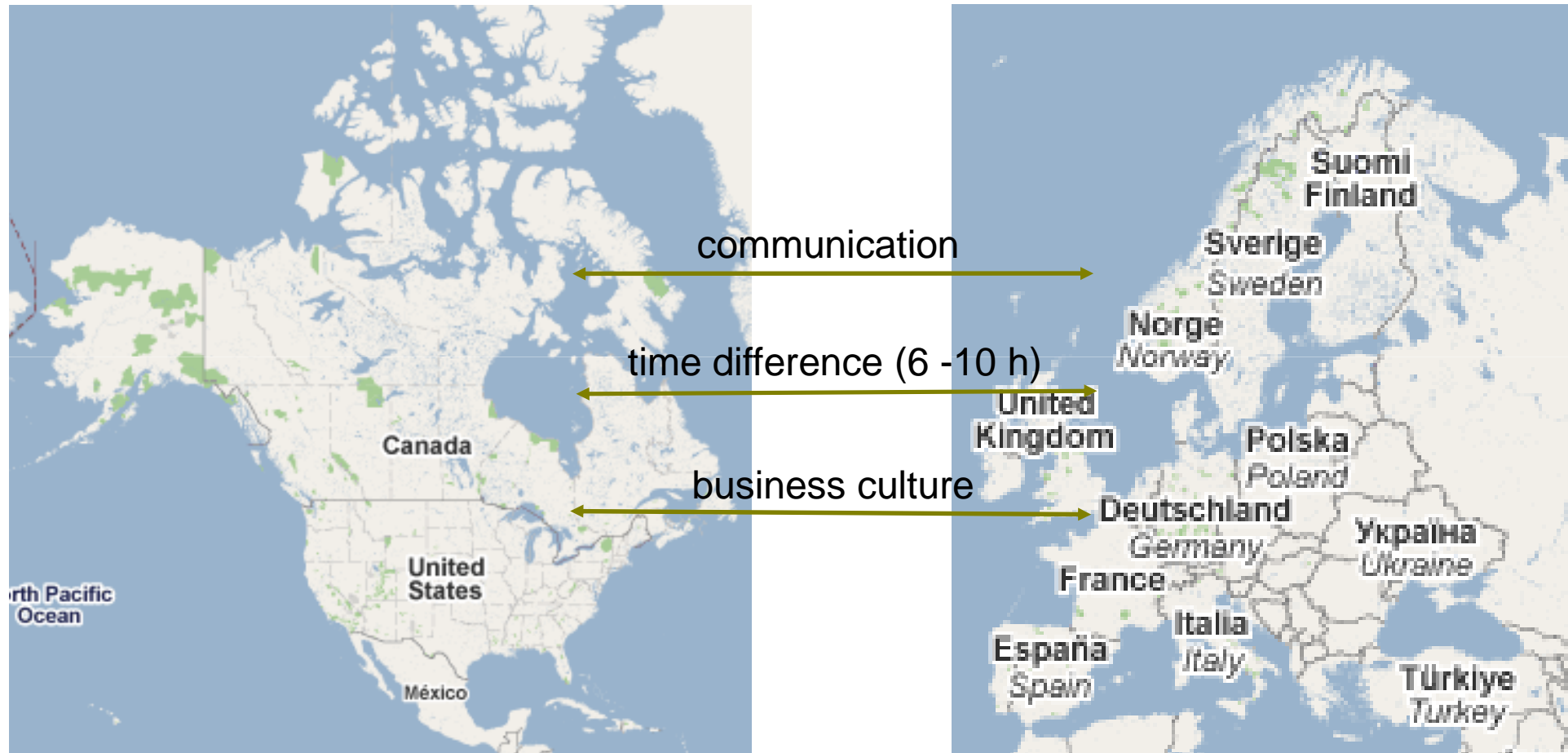


- start of construction: 2009
- digester: $2 \times 5,000 \text{ m}^3$
- CHP: $2 \times 1.4 \text{ MW}_e$
- 16 different substrates:
 - different liquid and solid organic waste,
 - manure
- external desulphurization
- closed reception hall
- solid liquid separation
 - waste water treatment
 - drying and pelletizing of solids

Supplier



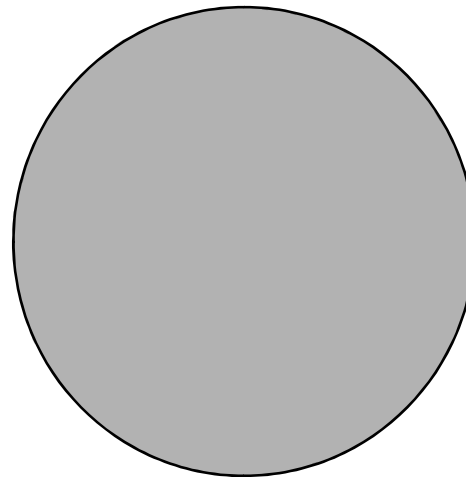
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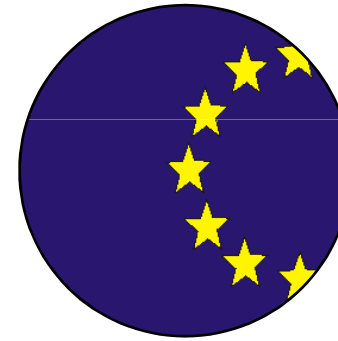
Supplier



25%



50%



25%

Piecemeal



- simple to organize different suppliers from North America and Europe
- interfaces management
- responsibility
- different business 'cultures'
- different legal backgrounds
- CSA approval
- National building Code
- 'Canadianising' of European equipment

EPC

Engineering-Procurement-Construction



- including full responsibility EPC
- must be North American company
- North American companies are not used to deal with European sub-contractors
- biogas suppliers in North America are by far not as experienced as European suppliers
- how can a North American EPC contractor take responsibility for something he does not know?
- OLR organic loading rate, HRT hydraulic retention time, degradation rate

 **EPC Difficult**

Organization and Supplier



	Saskatoon	Chino	Kensington	London
construction period	2003	2005	2008	2009/2010
organisation	Piecemeal (directly K&F)	EPC	Piecemeal (‘Canadianising’)	Piecemeal Approach (‘Canadianising’)
digester tanks	Steel Tank Europe	Steel Tanks North America	Steel Tanks Europe	Steel Tanks North American ?
top mounted mixer	North America	Europe	Europe	Europe
heat exchanger	Europe	Europe	?	?
CHP / gas user	Gas Turbine North America	Biogas Grid	Gas Burner North America	CHP North America ?
other tanks	Concrete Tank North America	(-)	Steel Tanks Europe	Steel Tanks North America ?
gas holder	Europe	(-)	Europe	Europe

Glass Coated Steel Tanks



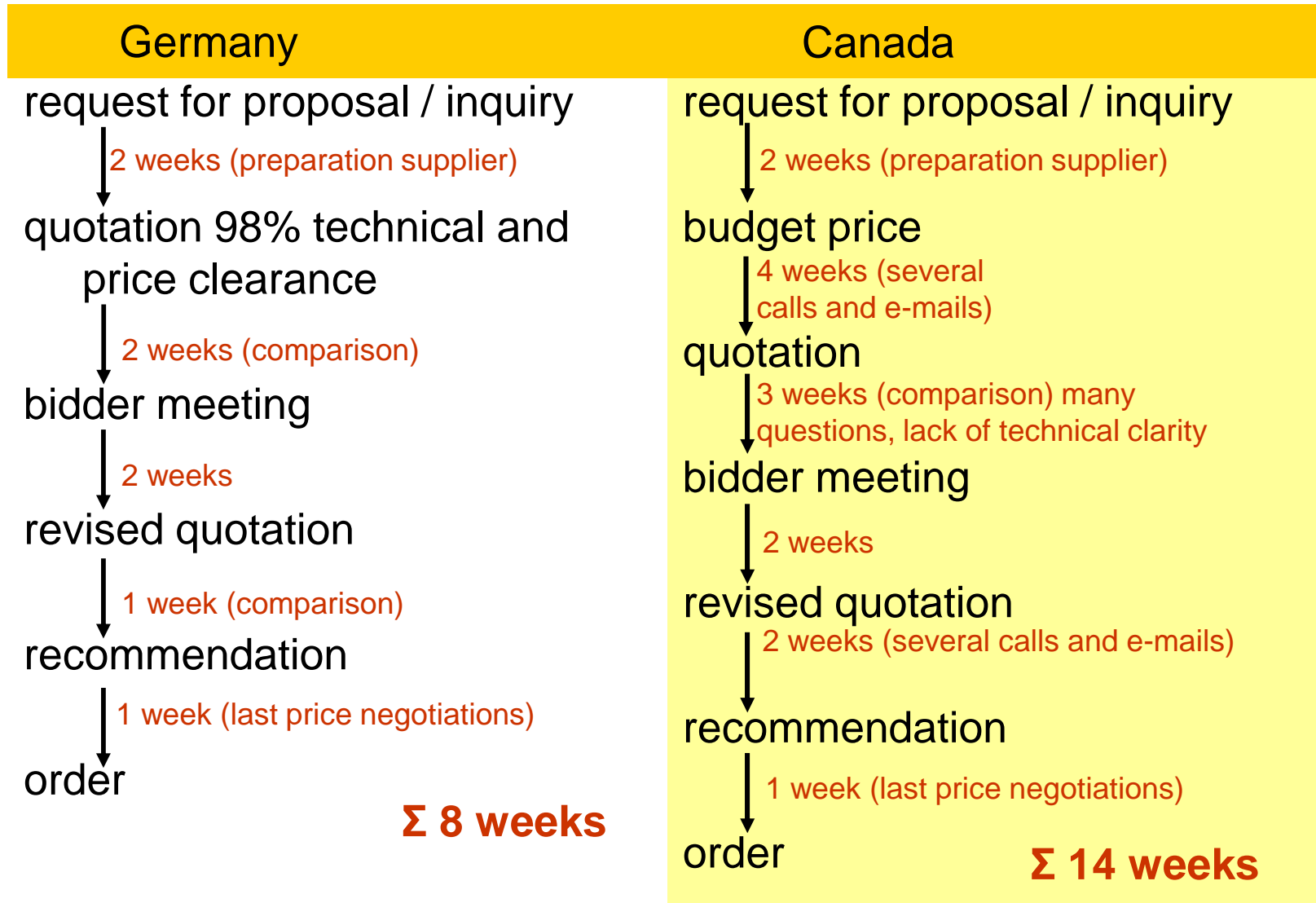
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Glass coated steel tanks



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Concrete Tanks



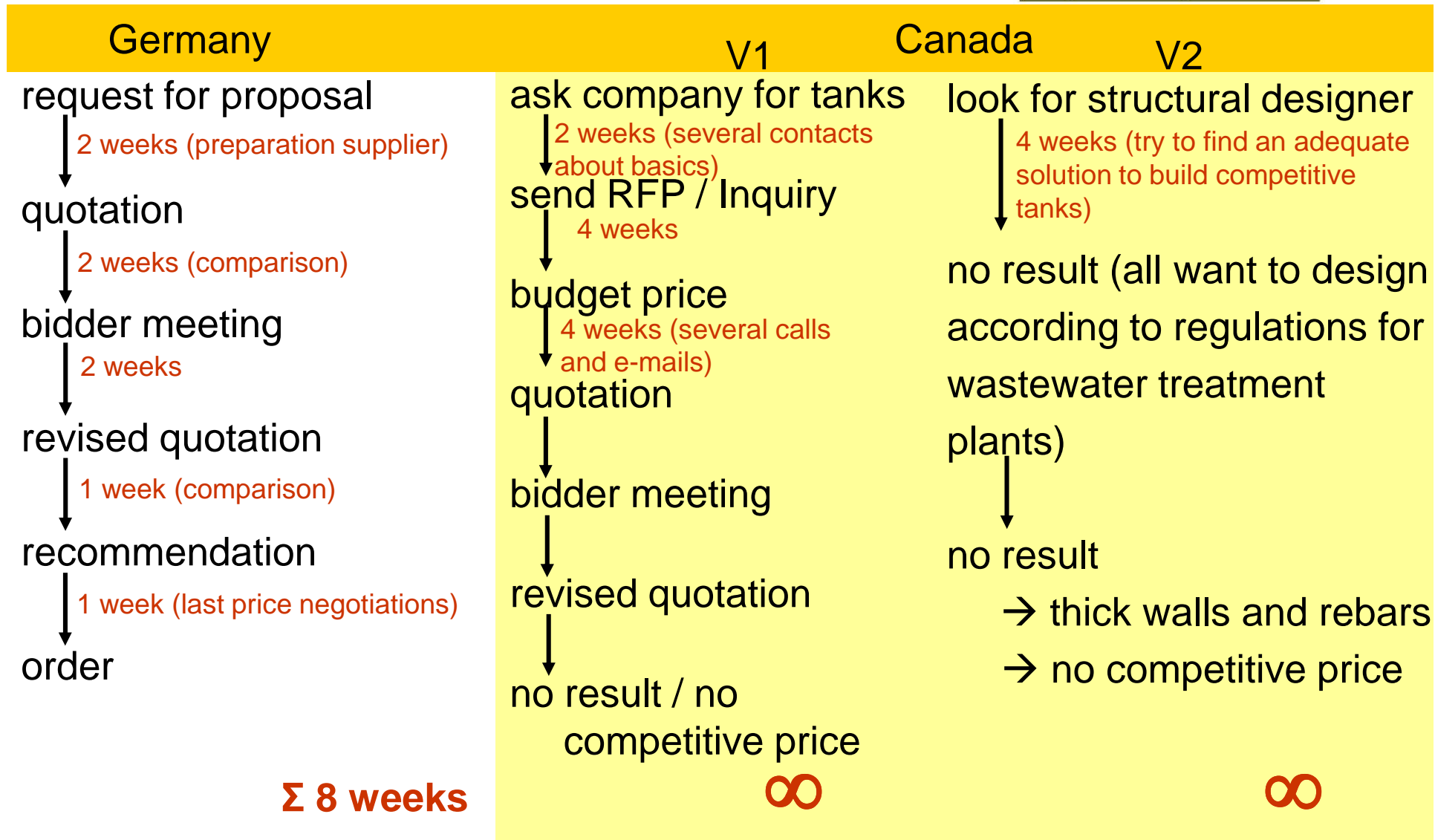
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Concrete tanks



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Conclusions / Summary



- It is possible to build big biogas plants in North America.
- There are different business cultures in North America and Europe.
- Companies in North America are not as experienced as European suppliers. It is obvious that in the past one or two years there is a growing interest to learn how to do it.
- European suppliers go to North America and build up own local branches.
- For big industrial biogas plants there are significantly higher requirements in North America (guarantee, interface management, 'Canadianising', etc.).
- As only North American EPC contractors can take the responsibility for EPC they must have an experienced European company as partner.

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