Hill Laboratories
BETTER TESTING BETTER RESULTS

ENVIRONMENTAL COMPLIANCE CONFERENCE 2016
RYDGES HOTEL
AUCKLAND

Sampling for Compliance & Investigative Purposes

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www.hill-laboratories.com

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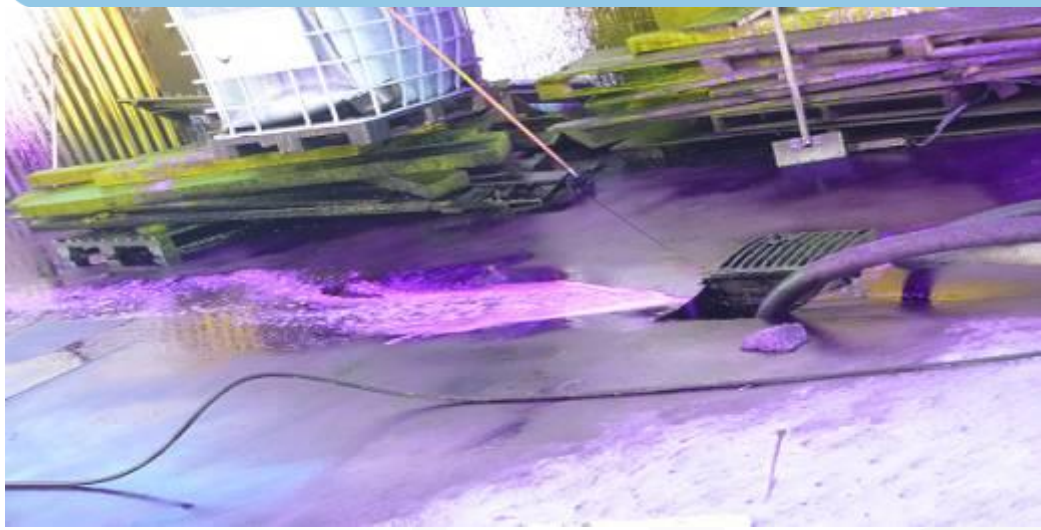
Why is the sampling being carried out?



Possibilities include;

- Incident Response.
- Possible Prosecution
- Consent Monitoring

Why Sample?

- All prosecutions and other enforcement are based on evidence
- Evidence in a physical form is referred to as an exhibit
- Samples are a type of exhibit

Legal Power to Take Samples

- The RMA provides an enforcement officer may take samples of any substance they have reasonable cause to suspect is a contaminant of
  - Air
  - Water
  - Soil
  - Organic matter

Legal Power to Take Samples

- An enforcement officer can take samples of
  - Water
  - Air
  - Soil
  - Organic matter
  - Any substance

  that may be a contaminant

Investigative sampling

Key Questions:

- Why sample?
- When to sample
- Where to sample
- How to sample

Why Sample?

- To provide evidence to confirm the location and party that has caused the discharge
- To confirm the potential contaminant
- To help determine the potential/extent of the effects to the environment
- To discount any other potential sources
  - This is called closing the loop

When to sample

- Best to collect samples once initial emergency controls are in place
- Balance in collecting evidence vs stopping discharge
  - Do not allow a discharge to continue to cause damage to the environment just to ensure you are getting enough evidence.
- Sample collecting is more important the less clear the offending is.

Document EVERYTHING

General Sampling

- Control sample
- Representative vs composite
- Sample must represent the situation at the site ie unbiased
- ? Collect 2 and give 1 to property owner
- Note time, weather, odour
- Photo of site, and sample in hand

How to Sample?

- Use clean equipment
- Take care not to contaminate (gloves)
- Collect cleanest first
- Photos, time/date stamped, GPS labelled

How to Sample - Water

- Field measurements (?pH, EC)
- Representative
- Layers eg hydrocarbons
- Clean equipment between uses
  - (Decon 90 – phosphate free, DI water).
- Collect into appropriate containers (?preservatives)
- Mighty Gripper

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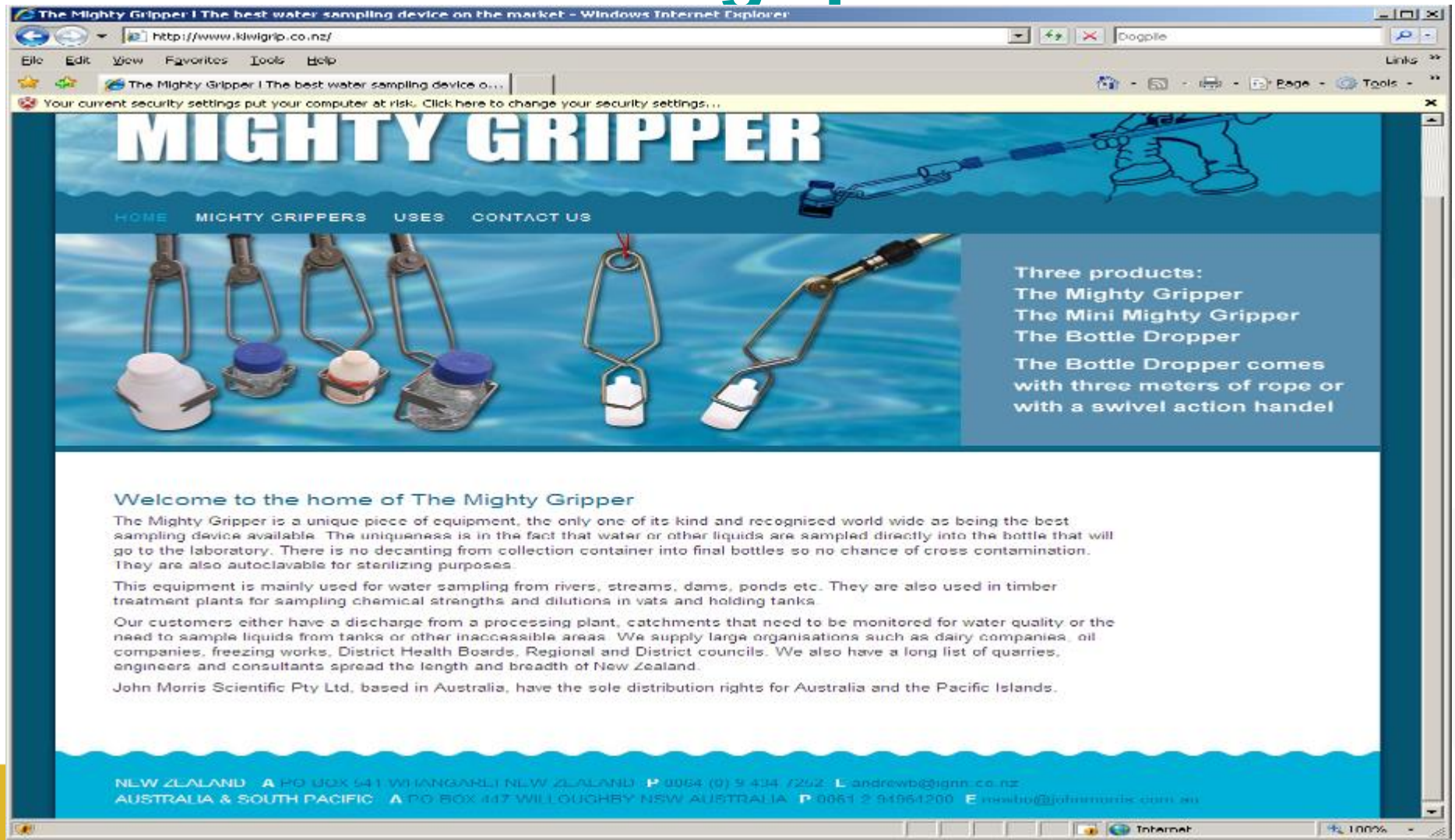
Mighty Gripper
www.kiwigrip.co.nz

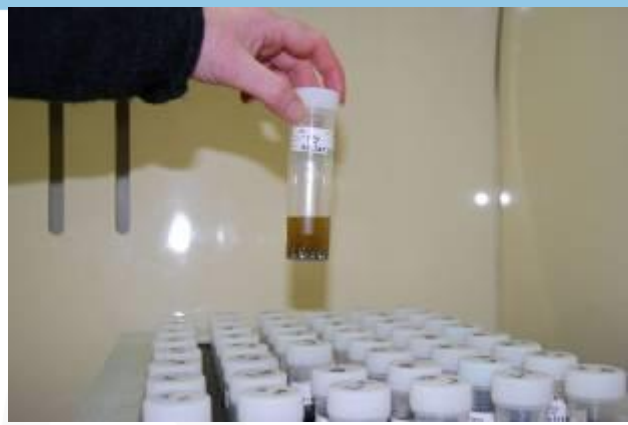


Where to Sample

July 1998 flood

- Initial sample at location of discovery
- Discharge point into natural water
- 100m downstream
- Upstream of discharge point into natural water (“Control”)
- Source
- Downstream extent of impact (if possible/able to be determined)
- Any other potential inputs (discounting other sources)
  - Number dependant (photos may suffice)
- The easiest way is to be systematic about the order in where you take the samples, same as tracing to source. Often do it in conjunction.

How to Sample - Soil

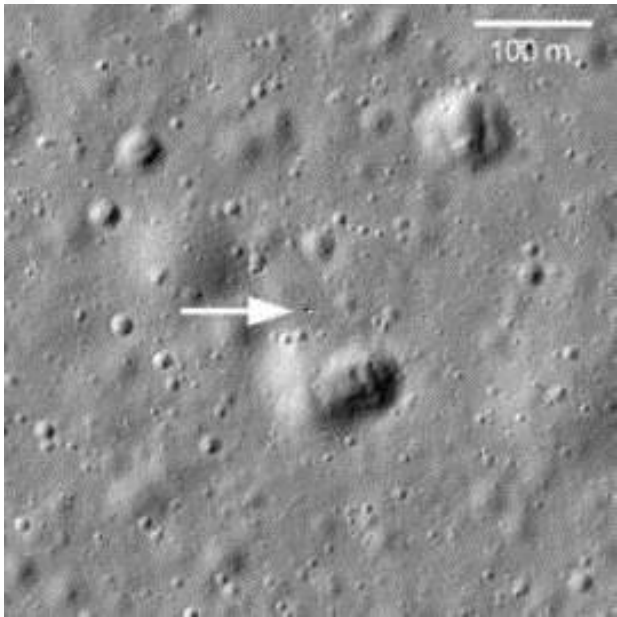


- Containers less important
- Plastic bags often OK
- Use a trowel (clean between each use)
- Use container as scoop
- Hydrocarbons are volatile and ‘sticky’
- **Representative** or **Selective**
- NB: Lab uses 0.5-20g for each test

Representative vs Composite

- Terms used to mean different things
- **Representative** sample - collecting many small samples and mixing into one container
- **Composite** testing – Several representative samples taken and submitted to the lab as separate samples.
  - Lab combines these for testing (to reduce cost), but retains some of each individual sample in case further testing of these needed.

Area in photo has one very significant ‘contaminant’. ?How to sample to find it.



How to sample – other?

- Use photos
- Sampling is 'selective'
  - to ID contaminant
  - to trace source
- Rena beads

Chain of Custody

- Arguably THE most important for prosecution
- MUST be signed at both ends, and perhaps by courier
- Chillybin and/or containers may have a ‘seal’ (which can be signed) and/or lock.
- Submission Form/COC
- Field sheet

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Chain of Custody (COC)

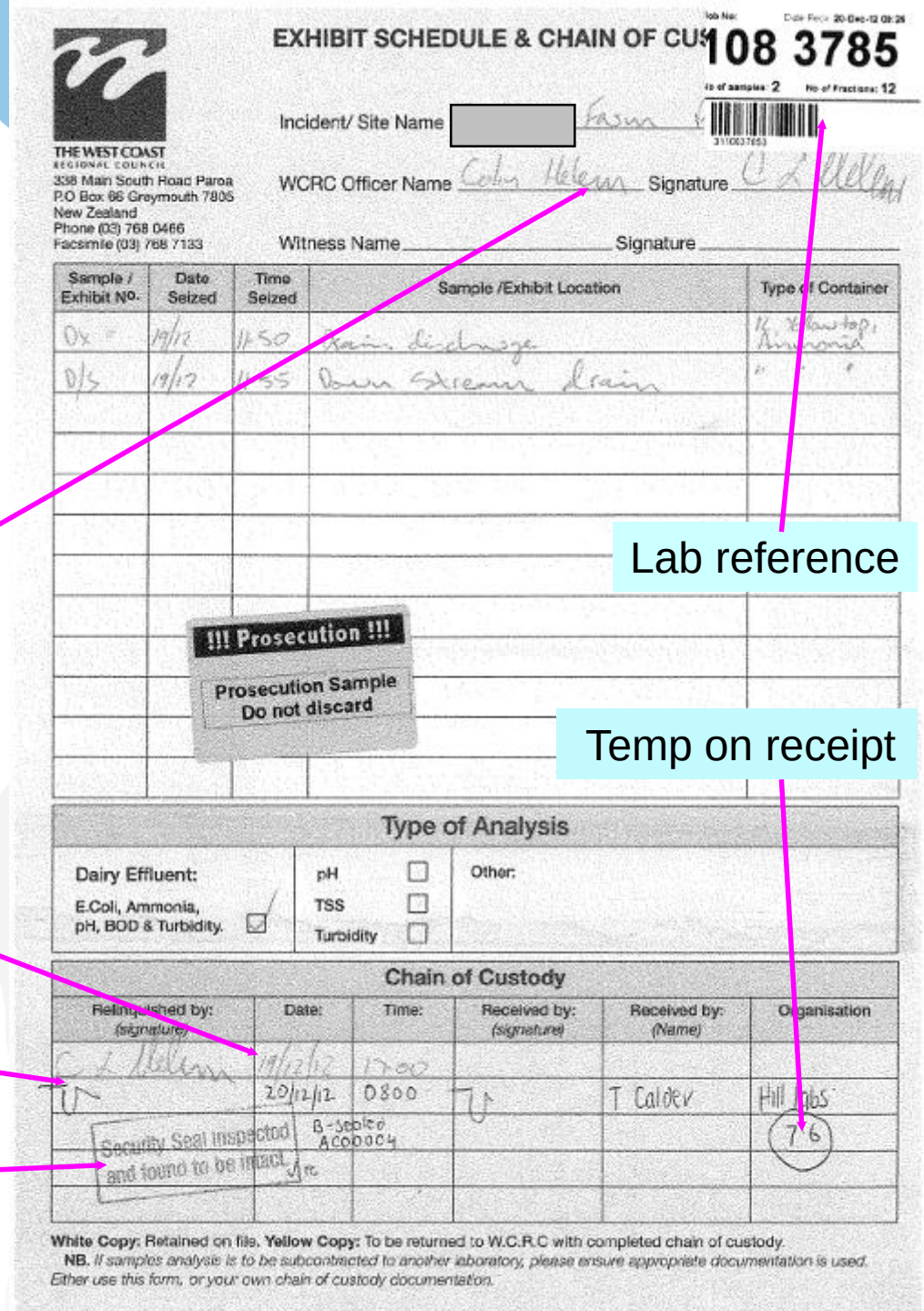

EXHIBIT SCHEDULE & CHAIN OF CUS 108 3785

No. of samples: 2 No. of Fractions: 12

THE WEST COAST REGIONAL COUNCIL
338 Main South Road Paroa
P.O Box 66 Greymouth 7805
New Zealand
Phone (03) 768 0466
Facsimile (03) 768 7133

Incident/ Site Name [redacted] Farm

WCRC Officer Name Colin Helem Signature

Witness Name Signature

Sample / Exhibit No.	Date Seized	Time Seized	Sample /Exhibit Location	Type of Container
Ox	19/12	1150	Main discharge	K Plastic, Ammonia
D/S	19/12	1155	Down Stream drain	" "

!!! Prosecution !!!
Prosecution Sample
Do not discard

Type of Analysis

Dairy Effluent:	pH	Other:
E.Coli, Ammonia, pH, BOD & Turbidity. ☑	TSS ☐	
	Turbidity ☐	

Chain of Custody

Relinquished by: (signature)	Date:	Time:	Received by: (signature)	Received by: (Name)	Organisation
	19/12/12	1700			
	20/12/12	0800		T Calder	Hill Labs
Security Seal inspected and found to be intact	B-Seal AC00004				7.6

White Copy: Retained on file. Yellow Copy: To be returned to W.C.R.C with completed chain of custody.
NB. If samples analysis is to be subcontracted to another laboratory, please ensure appropriate documentation is used. Either use this form, or your own chain of custody documentation.

Lab reference

Sampler – name and signature

Temp on receipt

When sent

Received by

Seal info

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Give the lab ALL the information

- Matrix [eg not “Water”, but ‘raw sewage’, ‘river’, ‘groundwater’, ‘saline’]
- **Hazards**, especially microbiological [eg raw sewage, Didymo risk, high cyanide]
    - Tests, of course!
    - Detection limits, [screen or trace. To meet specific requirements eg NZ Drinking Water Standards, NES]
    - Who to report to [can be multiple]
    - and How, [print/fax/email, pdf always, csv, xml, many specific formats]
    - Order number/invoicing [we do need to get paid!]

Transport

- Transport appropriately
  - packaging, temperature, time, labels/seals

Packaging!

Effluent container explosion!

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Transport

- Must consider transport both to “Base” and from Base to Laboratory.
- Security: must be signed for when transferred
- Ensure samples do not become contaminated during transport (eg by hydrocarbons).
- Do not expose to heat or sunlight.
- ***Temperature*** - chilly bin and ice if necessary
- ***Time*** send Friday, arrive Monday? [Check with lab]
- Understand test requirements eg BOD_5, VOC, turbidity
- ***Packaging [Glass prone to breakage!]***
- ***Documentation to include***
  - Chain of Custody!
  - Details of;
    - sender,
    - sample IDs,
    - tests required (include detection limits, standard methods, fraction - soluble, total, Quote)

What to test for?

Talk to the lab!

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http://www.nzic.org.nz/ChemProcesses/chem_processes.html

Chemical Processes in New Zealand - New Zealand Institute of Chemistry - Windows Internet Explorer

http://www.nzic.org.nz/ChemProcesses/chem_processes.html

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Chemical Processes in New Zealand

This second edition (1998) of our publication Chemical Processes in New Zealand is now out of print, but is still the most comprehensive account of the practice of chemistry in New Zealand. In addition to being bought and used by secondary schools, tertiary education institutions and public libraries, it was a source of information for, and used by, many businesses and organizations associated with chemistry in some way.

Although many of the articles are no longer fully up to date, having it available in electronic form on the web allows access for all and gives us the opportunity to update it and develop it further. The Institute would welcome offers of help and suggestions for this development.

The book contains 17 sections with self-explanatory headings, and various numbers of articles, (101 in all) under each heading. Individual articles can be easily downloaded.

- Production of Chemicals
- Chemicals and Soils
- The Dairy Industry
- The Forestry Industry
- Animal and Fish Products
- Food and Beverages
- Energy
- Metals
- Inorganic Materials
- Polymers and Surface Coating
- Detergents and Cosmetics
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- People and Chemistry
- History: Chemistry in the Development of New Zealand Industry - 1940

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http://www.nzic.org.nz/ChemProcesses/chem_processes.htm

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Energy

- Refining Crude Oil (PDF 169 kb)
  This article describes the operation of the NZ Refining Company at Marsden Point. It deals with the separation of components by fractional distillation, chemical alteration of the hydrocarbons produced to make more useful products, and desulfurisation and recovery of sulfur.
- Re-refining of Used Lubricating Oils (PDF 24 kb)
  This article describes Dominion Oil's process where the used oil is first boiled to remove water, and then undergoes fractional distillation. Gasoline, kerosene and diesel fractions come over first and followed by the lube oil fraction which has colour, odour and aromatic compounds removed by passing it through a special solvent. Additives then make for new lubricating oil.
- Processing of Natural Gas at Kapuni (PDF 48 kb)
  This article describes how carbon dioxide (about 43%) and hydrogen sulfide are removed from the natural gas stream by passing it over a stream of hot potassium carbonate (and how the potassium carbonate is regenerated), followed by removal of water and fractionation into four streams, ethane and lighter, propane, butane, and pentane and heavier.
- The Production of Methanol and Gasoline (PDF 234 kb)
  This article describes how methane is steam reformed to give syngas (CO and H2), and the synthesis of methanol from this at the Methanex sites in Taranaki. It also describes the conversion of methanol to gasoline by the MTG process developed by Mobil using zeolite catalysts. The MTG plant was mothballed in 1996.
- Chemistry in the Coal Industry (PDF 19 kb)

Questions?