

- Gas is treated on site, i.e. water and condensate (a gasoline-like liquid) are removed

- Gas is passed into a NAM ring line system. Spread across the gas field there are seven transfer stations to transfer gas from the NAM pipeline into the Gasunie pipeline network

- Natural gas is odourless – Gasunie adds an odorant for safety reasons

- Water and condensate are transported through a NAM pipeline to Delfzijl where they are separated

- Condensate is a valuable by-product and is brought by inland waterway to Shell and Esso refineries near Rotterdam

- Water is pumped back into its original rock formation at the edge of the gas field at Borgsweer (near Delfzijl)

- For each million m³ of gas, 8 m³ of liquid are produced (7 m³ water and 1 m³ condensate)



Compressor

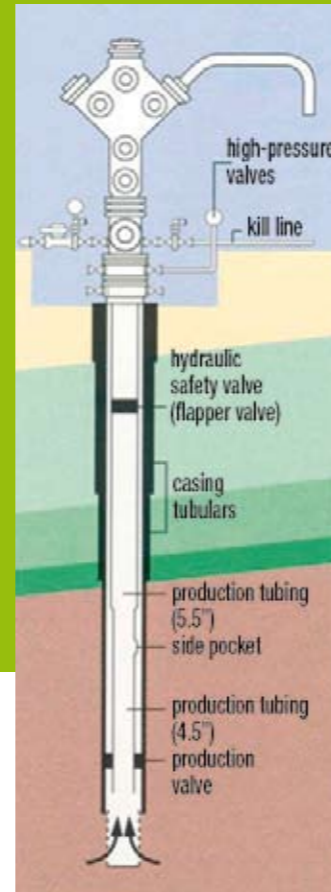


Characteristic flare stack is demolished



Groningen Gas Field

■ 'Slochteren'



Schematic diagram of a well

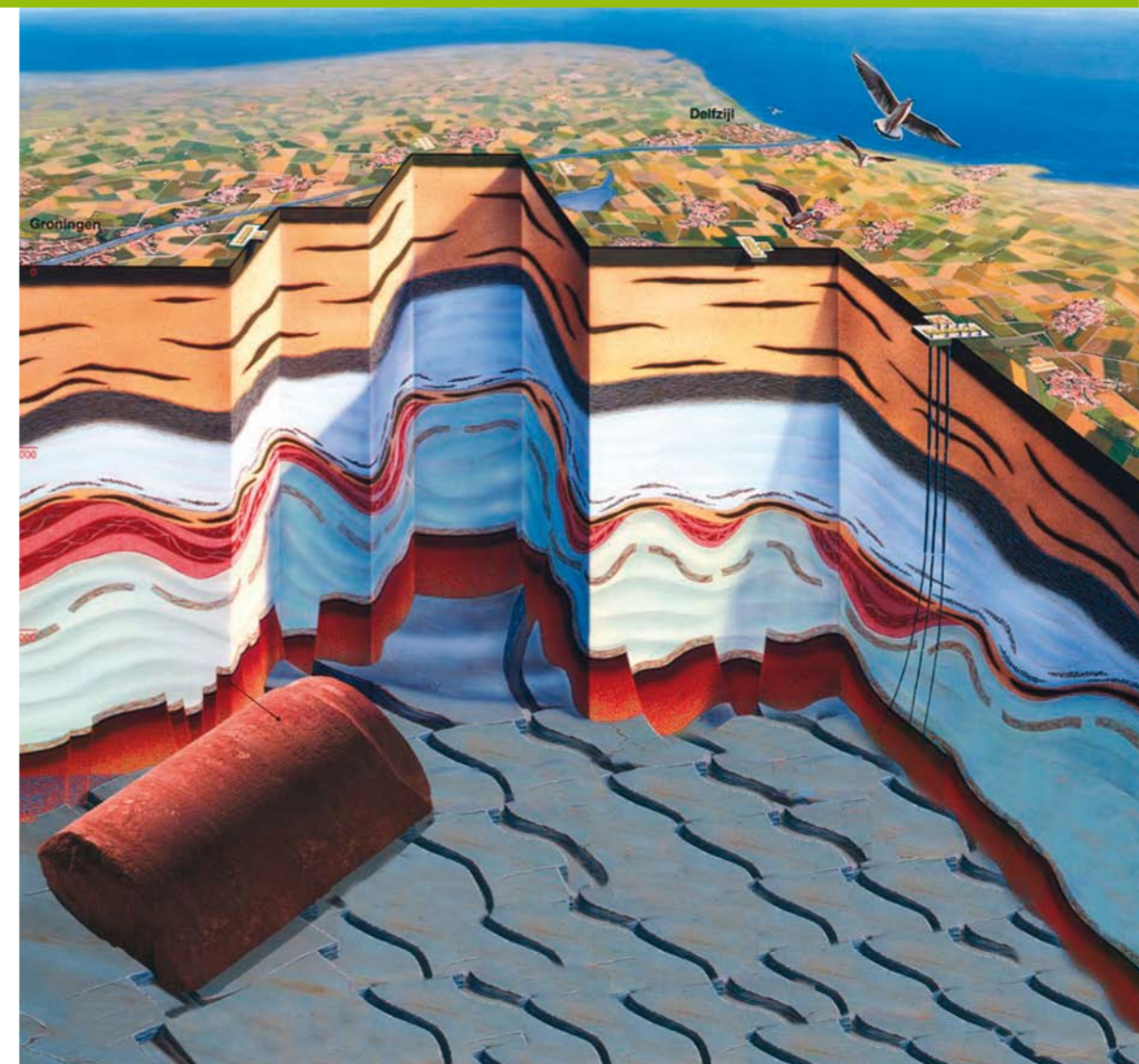
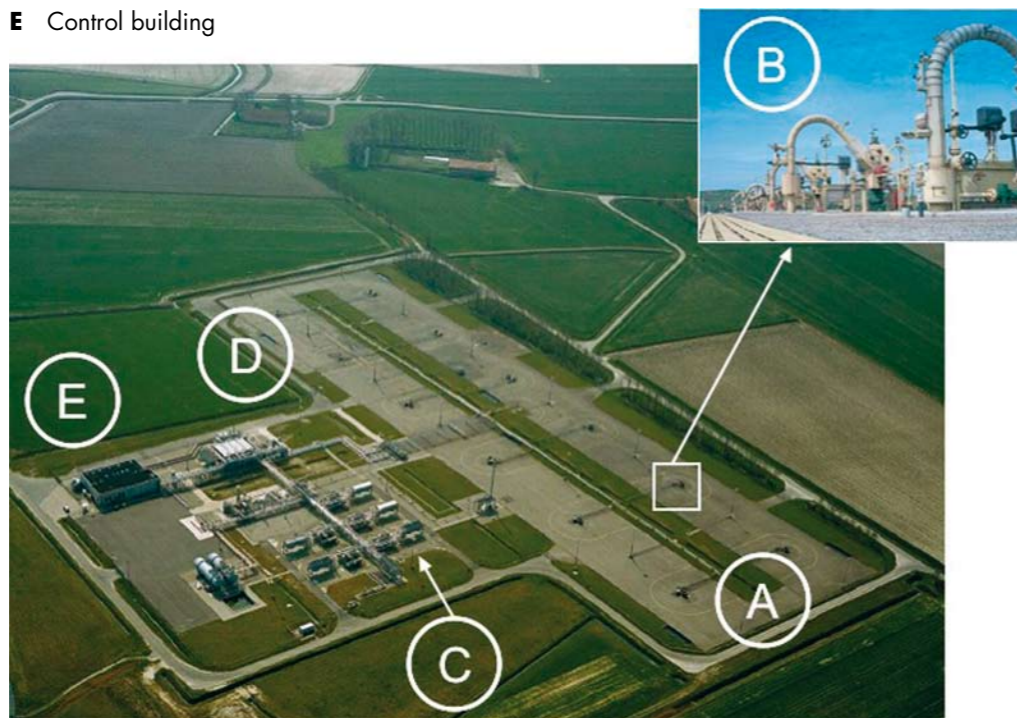
Facts and Figures

- One of the world's largest gas fields (is in Top 20)
- Discovered in 1959; production started in 1963
- Originally recoverable volume of gas: 2700 to 2800 billion cubic metres
- Already recovered: approx. 1700 billion m³; still recoverable: 1000 to 1100 billion m³
- So 60% of the gas has already been produced
- Depth: almost 3000 metres; thickness of gas reservoir rock: approx. 100 metres
- Extent of reservoir: approx. 900 km²
- Original reservoir pressure: approx. 350 bar
- Number of wells drilled: approx. 300, spread over 29 production clusters



Production cluster

- A** Wellsite with 8 to 12 wells
- B** Wellhead: above-ground part of well with valves, etc.
- C** Treatment plants: 5 identical units
- D** Power supply: 23 MW (equivalent to consumption of a medium-sized town, e.g. Assen)
- E** Control building





The well testing attracted much interest



Clusters spread across the field



Small fields policy + Groningen + Underground gas storage
 basic demand + swing + peak demand

Drilling of Slochteren-1

- Start of drilling: May 29, 1959, at 05.45h
- Discovery of field: July 22, 1959, at 06.33h
- Well testing: August 1959

Production

- Gas is produced at 29 production clusters, spread across the field
- Clusters are unmanned – they are controlled from the central control room in Sappemeer
- Maximum production per day: approx. 350 million m³
- For comparison: average gas consumption of one household is approx. 2000 m³ per year

Groningen field and gas storage form single system

Gas storage

- Due to ongoing production: decline of reservoir pressure in Groningen field
- Hence, decline of production capacity (lower rate of recovery)
- During very cold weather, Groningen can no longer supply enough additional gas
- Gas storage facilities meet peak demand
- Basic principle: in summer, gas is pumped into gas fields to maintain pressure; in winter, when needed much gas can then be quickly extracted



Three underground gas storage facilities in the Netherlands: Grijpskerk, Norg/Langelo (NAM) and Alkmaar (TAQA Energy)

Special role for Groningen field

- Dutch government policy since oil crisis (1973-1974): keep Groningen field in reserve; first explore and develop as many small fields as possible
- Consequently Groningen field has long-standing role as swing field: if gas demand exceeds total supply from small fields, Groningen field makes up the difference
- Small fields now account for about 30% of annual production, Groningen for about 70%
- Due to small fields policy, gas volumes equivalent to half the Groningen field have been discovered in hundreds of small fields
- Consequently, Groningen field is still almost half full; otherwise it would have been almost empty by now

Groningen Long Term – GLT

- Compressors to be installed at most clusters to draw gas out of the field (like the upstroke of a bicycle pump)
- Modernising of plant and technology (dating from 1960s and 1970s)
- Further environmental improvements (even cleaner and more efficient facilities)
- Less visually obtrusive (light/flare stack)
- Innovative engineering, e.g. compressors with magnetic bearings
- Fully unmanned – including fully automated remote start-up
- GLT project is one of the biggest capital investments ever made in the Province of Groningen
- Capital invested: approx. 2 billion euros over 15 years, completion in 2009

