

# **Blow out in Petroleum drilling**

# What is a Blow out?

- A blow out is simply the blowing up and or destruction of the drilling rig and associated installation due to sudden, violent and uncontrolled flow of fluids, i.e. Water, gas or oil from underneath the surface.
- Oil, gas or an overpressured water bearing layer in the subsurface , if penetrated by a drilling pipe, may force the fluid into the drilling pipe and come up to the surface with very strong force causing a blow out.





Tengratila (Chattak gasfield) well blow out in 2005



## Why/how does a Blow out happen?

- The pressure of the mud column at the bottom of the hole is a function of the mud density and column height.

$$P = 0.0519 \times W \times D, \quad \text{where}$$

P = hydrostatic pressure (psi)

W = mud density ( pound per gallon)

D = vertical depth

- The pressure must be adequate at all time to prevent the flow of formation fluids into the mud column.
- Should the density (and therefore P) falls below that which is necessary to hold back formation pressure, then formation fluid can enter the well. This termed a “Kick”.
- If this condition is allowed to continue unchecked for even a short time, mud weight (density) may be reduced severely and an uncontrlloed flow of formation fluid will result. This may lead to a blow out.



- It is therefore customary to maintain a proper mud circulation through the drill pipe during drilling in order to counter the underground fluid flow into the drill hole.
- This is done by increasing the mud weight whenever a force is encountered in the subsurface.
- Any delay or failure to maintain such circulation may cause a blow out.

## What are the indication of fluid flow from the formation ?

- An increase in the rate at which the drilling fluid is returning to the well when pumping rate has not been increased.
- An increase in the level of mud pit (volume increase).
- A decrease in the density/ sp.gr. of the returning mud.
- If the fluid continues to flow after the mud pumps have been stopped.
- Gas cut mud (i.e. Gas show in the drilling mud).
- An abrupt change in penetration rate. It can indicate that the bit has drilled into a formation that is likely to contain fluid under pressure.



# When is blow out most likely?

## 1) Tripping:

- Danger of blow out is greatest during tripping.
- During trips, control of formation can be lost if the hole is not kept full of drilling mud as the pipe is withdrawn.
- Mud level falls an amount equal to the volume of the steel pipe withdrawn. If this is not replaced by adding mud, then the pressure at the bottom hole is decreased and this may result in formation fluid entering the hole.
- If the pipe is pulled out too fast, swabbing may result. Swabbing decreases the pressure exerted by the fluid column below the bit and the formation fluid may flow into the well.

## 2) Shallow gas :

Control of a well can be lost while drilling through gas sand at shallow depth. Shallow gas sand has higher pressure than the normal formation pressure.

### 3) Overpressured zone:

- Overpressure zone in the subsurface is commonly related to blow out.
- Normal formation pressure is equal to the hydrostatic pressure exerted by the fluid column above the depth of interest.
- Formation pressure greater than the normal hydrostatic pressure is called Overpressure.
- Overpressure may be caused by various reasons:
  - Rapid burial of low permeability sediment (clay) under which water can not be squeezed out.
  - If the formation is extended to the surface at higher elevation.
  - Shale/Clay diagenesis.
  - Compaction (Main)
  - Shallow prospects
- An overpressure would obviously force the formation fluid into the hole if the mud pressure is not increased to counter the overpressure.

## How to handle a Kick?

***The occurrence of a kick does not necessarily mean that a blowout is inevitable. Indeed, kicks are handled routinely by experienced crews using the proper equipments and procedures. Relatively few kicks result in total loss of well control and blowout. But if kicks are not handled properly, blowout can result.***

**A number of techniques have been used when a kick occurs. In general the procedures to follow when a kick is indicated include these steps.**

- 1) As soon as one of the warning signs of a kick is observed, the well should be shut in. This is done by stopping the mud pump and closing the Blowout preventer around the drill string.**
- 2) Notify key company personnel at this stage that a kick is suspected and that the action in step 1 has been taken**
- 3) After the system has reached equilibrium- may be a few minutes- the pressure on the drill pipe, the pressure on the casing and the increase in the volume of mud pit are recorded.**
- 4) At this point the calculation can be made to determine the type of fluid entering the well bore, the weight of the mud needed to stop the flow and other data necessary to implement the kill procedure.**

**5) “Kill weight” is the mud weight that will provide a hydrostatic pressure at the formation exactly balancing the pressure in the formation. Increasing the density of the drilling fluid to the “kill weight” is necessary in order to stop the flow of formation fluid into the borehole.**

**6) After the well has been shut in and the weight of the mud that will be needed to kill the kick has been determined, the remainder of the procedures involve various ways to circulate out the kick.**

**7) HOWEVER, SHOULD THERE BE ANY FAILURE IN THE ABOVE PROCEDURES FOR ANY REASON AND THE WELL IS HEADING FOR AN IMMEDIATE BLOW OUT, THE ACTION TO TAKE IS**

**JUMP OUT OF THE RIG PLATFORM  
AND SAVE YOUR LIFE.**

# Types of blowouts

**Well blowouts can occur during the drilling phase, during well testing, during well completion, during production, or during workover activities.**

## **1. Surface blowouts**

## **2. Subsea blowouts**

The two main causes of a subsea blowout are equipment failures and imbalances with encountered subsurface reservoir pressure

## **3. Underground blowouts**

An underground blowout is a special situation where fluids from high pressure zones flow uncontrolled to lower pressure zones within the wellbore

# **Blowout events in Bangladesh**

**1956: Haripur (Sylhet gas field) blow out**

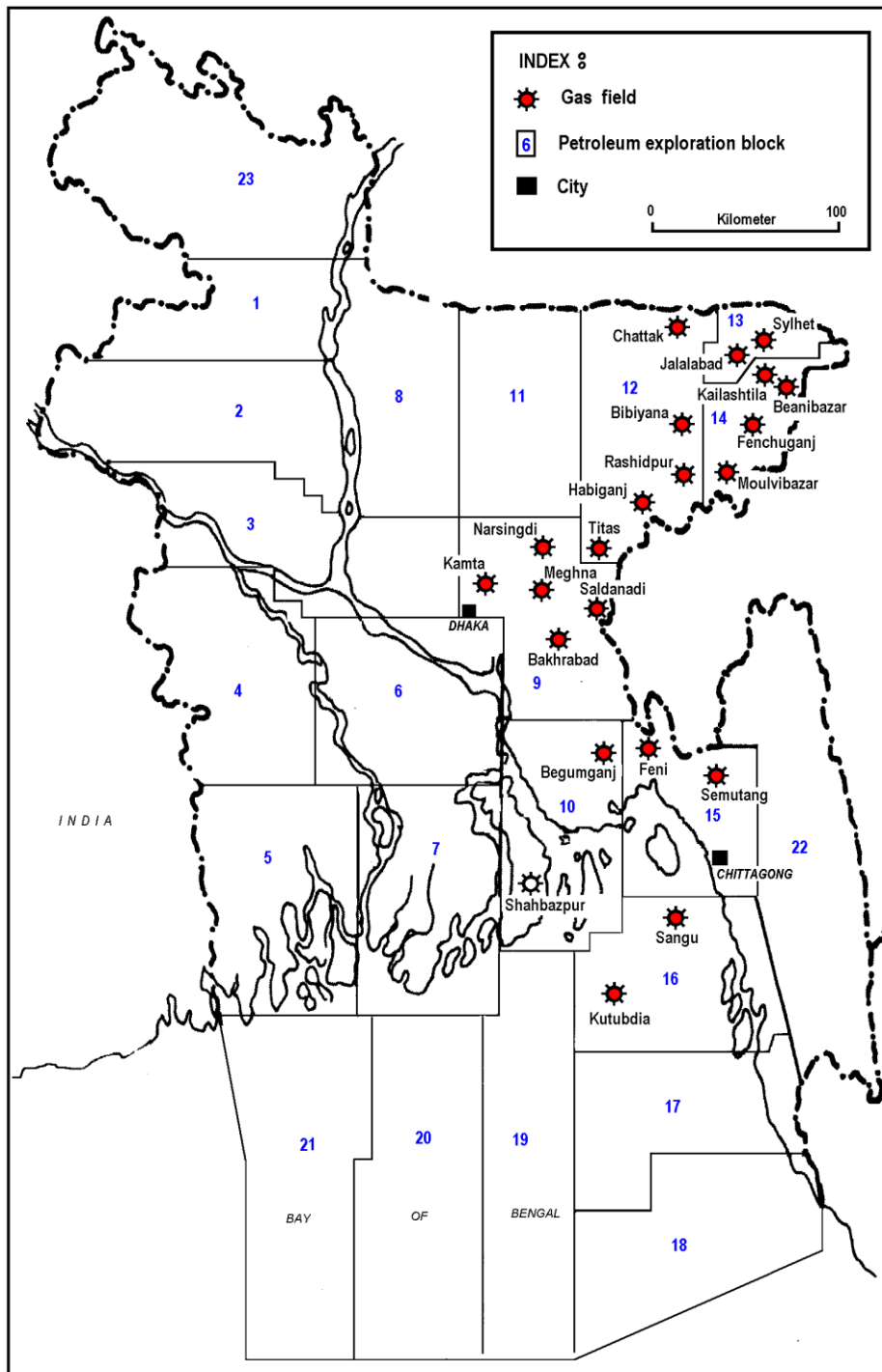
**June 1997: Magurchara (Moulvibazar gasfield)  
blowout**

**January 2005: Tengratila (Chattak gasfield)  
blow out**

**June 2005: Tengratila (Chattak gasfield) relief  
well blow out**



# GAS FIELDS OF BANGLADESH



Haripur (Sylhet gasfield) blow out of 1956, photographed in 2003.



Tengratila (Chattak gasfield) well blow out in **January 2005**



Relief well blow out in [June 2005](#)





Tengratila (Chattak gasfield) well blow out in 2005



# Tengratila Relief well blow out in June 2005





# Tengratila (Chattak gasfield) well blow out in 2005





Photographed in September 2005, Tengratila





Photographed in September 2005, Tengratila





Photographed in September 2005, Tengratila





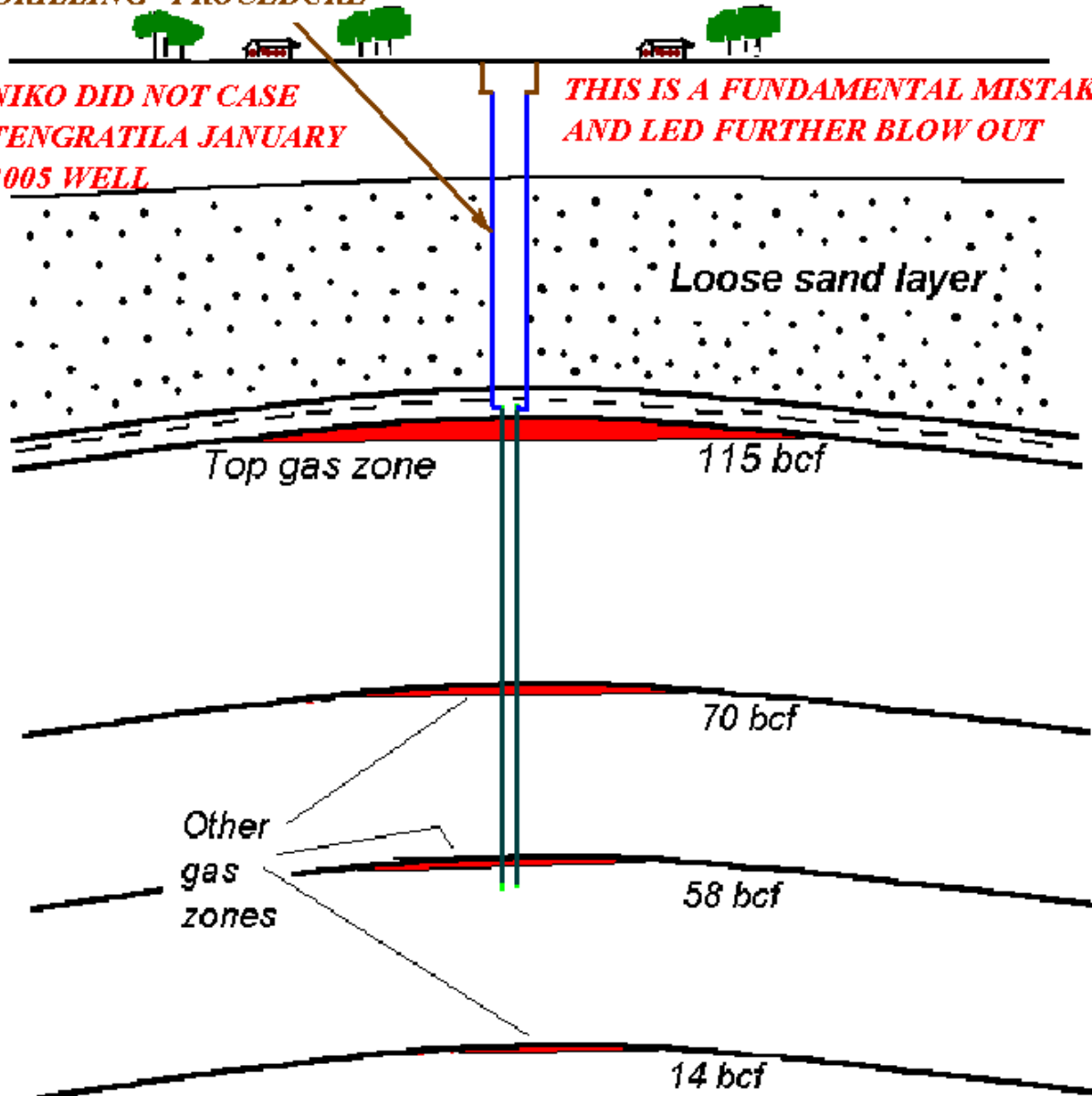
Photographed in September 2005, Tengratila



**CASING THE HOLE THROUGH LOOSE SAND LAYER IS NORMAL  
DRILLING PROCEDURE**

**NIKO DID NOT CASE  
TENGRATILA JANUARY  
2005 WELL**

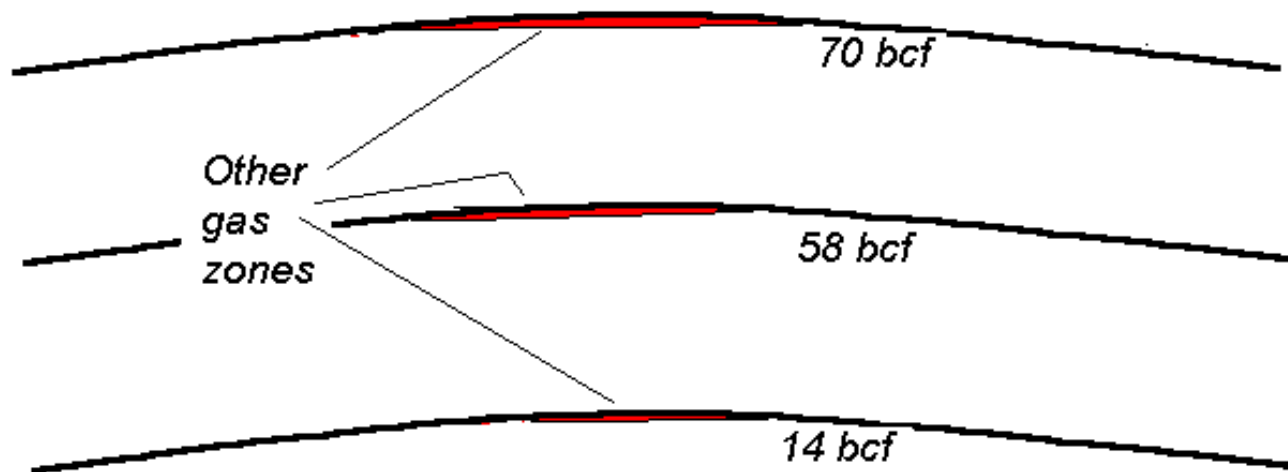
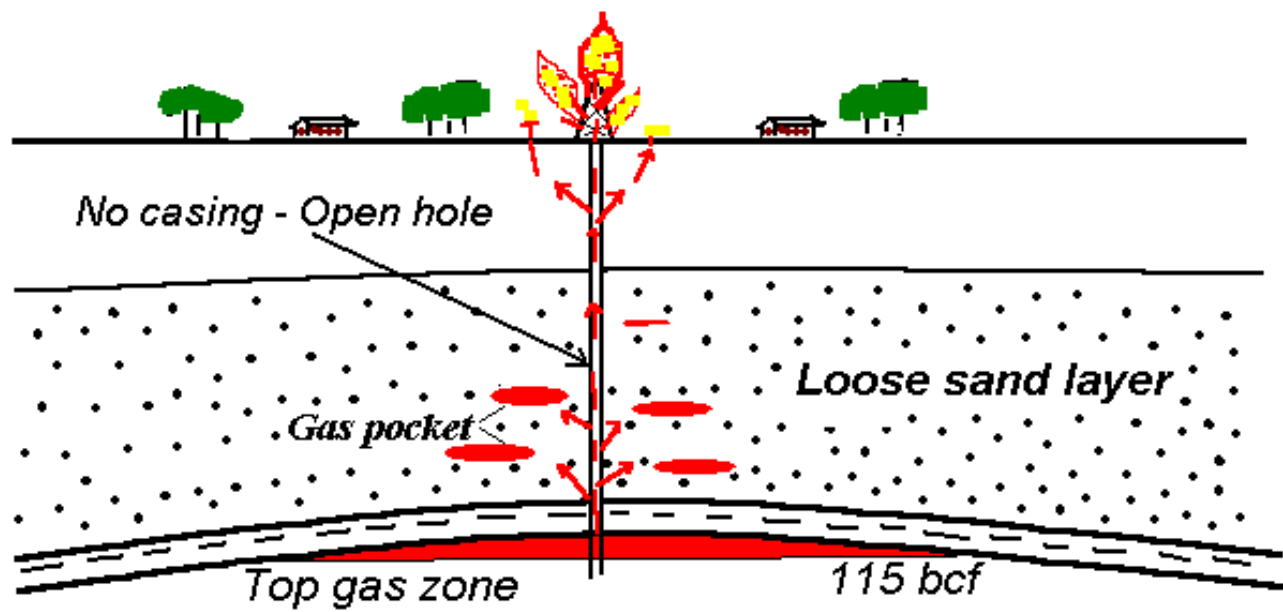
**THIS IS A FUNDAMENTAL MISTAKE  
AND LED FURTHER BLOW OUT**



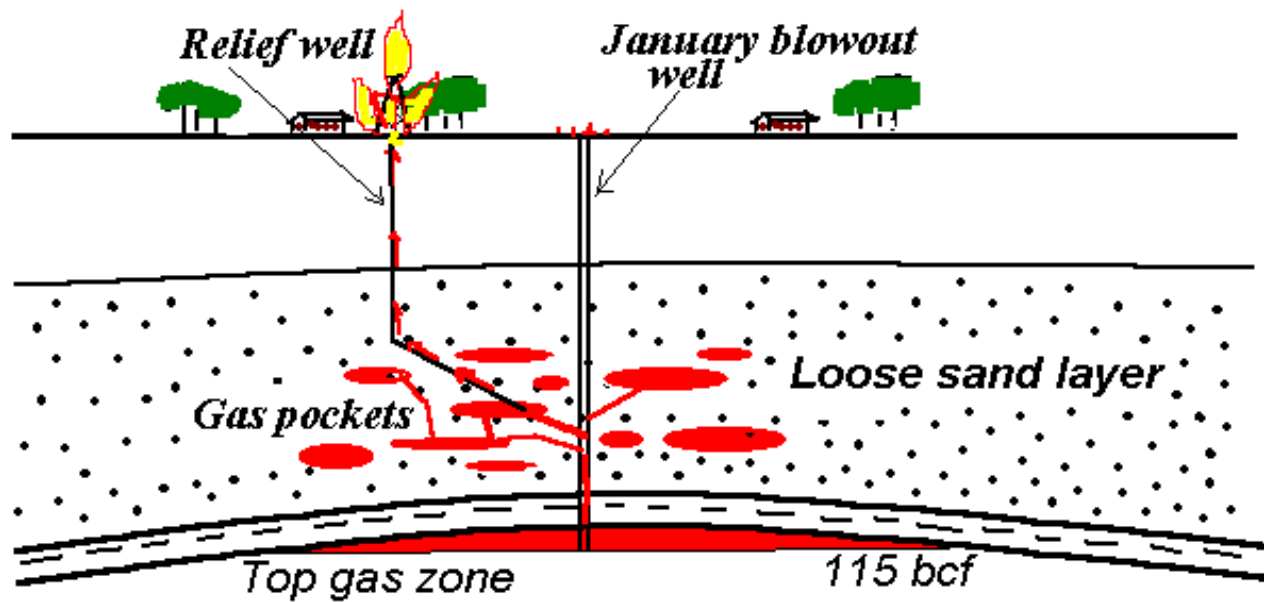
**CASING JOB IS  
FUNDAMENTAL  
TO ALL  
PETROLEUM  
DRILLING**

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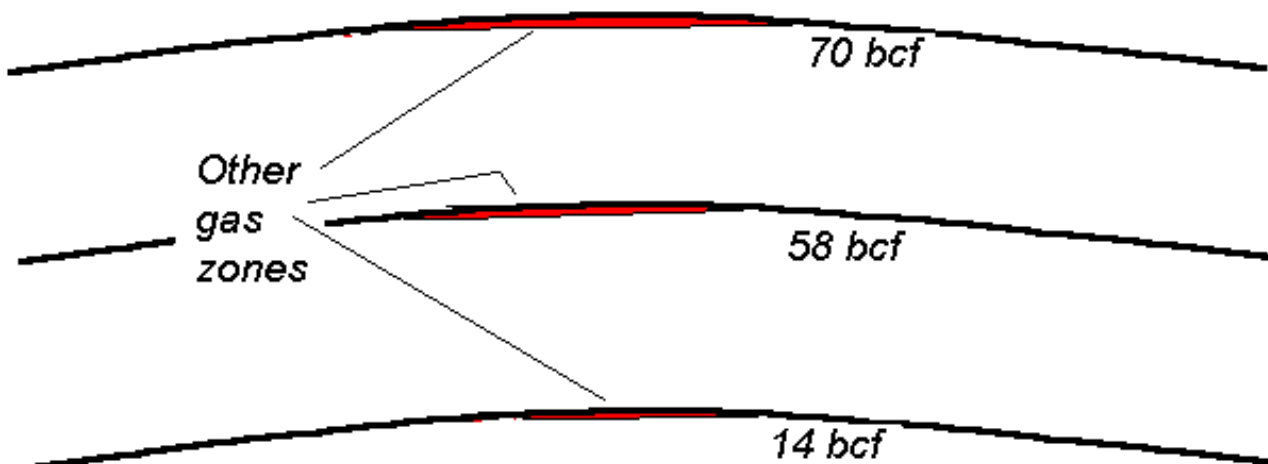
**NIKO'S  
NEGLIGENCE  
TO SET PROPER  
CASING  
IS PRIME CAUSE  
OF  
UNDERGROUND  
DAMAGE  
TO THE GAS  
FIELD**



**Tengratila relief  
well Blow out  
June 2003**



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**A CONSEQUENCE  
OF EARLIER  
BLOWOUT AND  
POOR HANDLING  
THERE AFTER**