Trade & Investment Mine Safety

NSW GOVERNMENT

MINE SAFETY INVESTIGATION UNIT

INFORMATION RELEASE

High risk incident

Date	Incident occurred on 14 July 2013
Event	Unplanned ejection of 18 drill pipes from a gas well
Location	Kingfisher E01 conventional gas discovery well, Casino, NSW

At a glance

About 200 m of steel drill pipe was forcibly ejected from a gas well due to an unplanned release of gas at high pressure. The gas well was being decommissioned at the time. Some workers were put at serious risk of harm from falling pipes.

The workover rig showing the swivel and a portion of the ejected pipe *Photograph supplied by Metgasco*

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The exploration site

Kingfisher E01 is a conventional gas discovery well (non-CSG) in the Clarence Moreton basin near Casino NSW. Discovered and drilled in 2009, it accessed good-quality CH4 gas at a depth of around 2000 m.

It is one of a number of wells operated by Metgasco Ltd that are subject to a decommissioning and rehabilitation program. Kingfisher E01 is located within PEL 16 granted under the *Petroleum (Onshore) Act 1991* to permit the exploration for hydrocarbons.

The workover rig

Photo depicts the rig from the Kingfisher incident after it has been redeployed to its next job.

Photograph by NSW Mine Safety

The incident

On 14 July 2013, about 200 m of pipes and drill collars were rapidly ejected from the Kingfisher E01 gas well, into the air, and landed in the vicinity of the drill pad and a number of workers. No one was injured as a result of the incident; however the safety of the workers was affected. The risk to which the workers were exposed is considered by investigators to have been very high. There was also significant equipment damage associated with the incident.

Suspended drill string

Some of the drill string still suspended mid-air after the event.

Note: the lighting tower in the foreground had some lights torn off by the falling pipes, some of which can be seen lying on the ground.

Photograph supplied by Metgasco

The incident occurred during attempts to decommission the Kingfisher E01 well. The well was over 2000 m deep and was experiencing continually rising pressure in the annular void around the production casing. The production casing was a 4½ inch diameter steel casing installed in the full depth of the well.

The pressures experienced in the annular void led to the installation of a temporary isolation plug (bridge plug) at about 200 m rather than at a greater depth. Loss of integrity in the well meant that gas under pressure could migrate between the inside and outside of the casing. This had been known during the operating life of the well.

Plans had been made to plug and abandon the well which involved killing well production by pumping heavy fluid down the well bore and into the reservoir, removing the well head and ultimately rehabilitating the site. This non-preferred kill method, known as bullheading, was made necessary by the lack of any pre-planned means of conducting heavy kill fluid into the well. This process is conventionally performed using a kill string.

Removal of the well head required a bridge plug to be installed at some depth in the production casing to block any flow from the well and allow safe removal of the well head and installation and testing of a blowout prevention valve assembly. It was intended to then mill (grind) out the temporary bridge plug to allow a program of cementing the well from total depth back to the surface.

Accordingly, the well was killed by a process of bleeding off pressure and admitting heavy fluid. It was monitored overnight and considered to be no longer making pressure.

The bridge plug was installed 200 m down from the surface. The rationale for selecting this relatively shallow depth was, in part, the thought that the production casing integrity problems were likely to be below the bridge plug. The well head work was completed and the crew set up to mill out the bridge plug not expecting that the gas pressure had built up beneath the plug.

Bridge plug

A bridge plug similar to that used in the Kingfisher well. Its purpose is to seal the bore casing at a predetermined depth to isolate any pressure or fluid generated below the plug. It can be drilled out or milled when it is no longer needed.

Photograph by NSW Mine Safety

After a period of milling, work was stopped for the day and the driller pulled back the drill string. As he did so the drill string began to eject from the well. The mass of the drill string components was insufficient to overcome the well pressure. The drill string was ejected from the hole with powerful force.

There were six workers at various locations around the drill pad. The workers report running away from the workover rig towards safe muster points and in doing so saw sparks and a brief ignition of gas above the rig as the last of the pipes ejected from the well. The drill string broke into four parts which fell in the vicinity of the drill pad and the six workers. One of the drill pipes was ejected over the drill pad fence into the neighbouring paddock.

Drill pipes

A bundle of regathered drill pipes damaged during the incident.

Photograph by NSW Mine Safety

Drill collars

The four lowermost segments of the drill string were of far heavier construction. These ‘drill collars’ are intended to provide weight to the drill string. In this case four collars were insufficient to defeat the pressures encountered in the well.

Photograph by NSW Mine Safety

Swivel

The swivel located at the top of the drill string was also damaged.

Photograph supplied by Metgasco

Collateral damage

These pipes are remnants of a fence that was in the path of the falling drill string components. They provide an illustration of the destructive forces at work.

Photograph by NSW Mine Safety

Observations

The incident discloses high risks associated with drilling activities. The causes and circumstances surrounding the incident are being investigated by the department's Investigation Unit.

Recommendations have already been made in Safety Alert SA13-08 *Drill string ejected from hole* published on the department's website.

The incident highlights the need for a carefully prepared and reviewed 'plug and abandon' program that is developed using sound risk management principles.

Conventional means of killing a well, such as a kill string, should be incorporated into the life-cycle management plan of the well.

Where bridge plugs are used, and are to be drilled through, measures to control the risk of encountering well pressure should be identified and implemented.

About this information release

The Mine Safety Investigation Unit has issued this information to draw attention to the occurrence of a serious incident in the petroleum-onshore gas industry. The investigation is ongoing. Further information may be published as it becomes available.

The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Department of Trade and Investment, Regional Infrastructure and Services or the user's independent adviser.
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www.resources.nsw.gov.au/safety/major-investigations
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