

## Chapter 73

# Workover Impact on Accidental Risk

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### ABSTRACT

*Certain risks are very common to any application of a downhole control system during workover while others will be field-specific or at least increased or decreased by the given well conditions. Workover anomalies may be caused by erosion, corrosion, mechanical errors, temperature effects on electronics, wear and tear on the dynamic seals, or seizure of moving components. Obviously, the simpler the system and the fewer moving parts, the fewer components are available to fail. Procedures and supporting control software must be developed to ensure optimum system use. Blowouts are not very common today as most blowout preventing systems serve the purpose. However, occasionally, these systems may fail due to either technical problems on the wellbore equipment or human error. Both reasons can cause enormous damage on wellbore equipment, reservoir, surface facilities, or even human loss. The right accidental risk assessment approach can reduce the chances of repeating bad scenarios that happened in the past.*

### INTRODUCTION

In general, workover refers to any kind of well intervention or remedial treatment on oil or gas well involving different methods and techniques common in drilling and completion department. In most cases it implies the wireline or slickline operations, tubing replacement, coiled tubing services, snubbing unit services etc. Reasons for such treatments or interventions are numerous (Jahn et al., 2008)- mechanical damage of downhole equipment (corroded or damaged tubing string, stuck wellbore tools), reservoir

productivity impairment, flow restriction due to sand production or scale deposition, water or gas breakthrough, cross flow in the wellbore or behind casing, downhole control system failures, wellhead completion parts failures and other. Usually, if a workover operation is needed, a workover rig is required as well, except in cases of coiled tubing or subbing unit operations.

Perrin et al. (1999) described some of the equipment failures and modifications urging for intervention. That would be *wellhead equipment failures* (leaks at the lower master valve, tubing hanger or tie-down screws, damaged back pres-

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sure valve seat, leak or failure at the controllable subsurface valves control line outlets, wellhead penetrator failures etc.), *downhole equipment failures* (tubing or wireline retrievable safety valves are faulty, landing nipple or wireline retrievable safety valve, packer, locator, slip joint or circulating sleeve are leaking, control line failure, annular safety system failure, gas-lift valves stuck, fish not processed properly via wireline, downhole gauges failures) and many other problems met during the life of a well.

Rig site safety is considered to be a significant factor in the oilfield for many years now and continues to improve its worthiness. In spite of all safety precautions undertaken during a certain operations performed in the well accidents continue to occur with the results mentioned earlier. What can we do to further improve safety on the rig is a question all the oilfield companies try to answer investing a lot of assets in it. Term rig safety firstly refers to human life preservation and then wellbore integrity and equipment maintenance. As everything starts with well integrity no human life or wellbore equipment will be preserved without it.

## WELL INTEGRITY

Well integrity represents risk reduction of formation fluids uncontrollable releases. Reasons for well integrity loss are either of technical nature, as well completion or surface equipment failure or in a form of human error. Well control loss, and thus blowout, is a result of the two mentioned. Blowouts can lead to disastrous events with the result of a loss of human life, environmental impacts or equipment damage. Fatality risk in exploration activities is partially expressed by blowout occurrence. According to Corneliussen (2006) measure for the fatality risk is demonstrated as FAR (fatal accident rate), which is a frequency rate defined as the expected number of fatalities per  $10^8$  hours of exposure. When elaborating the environmental pollution, workover blowouts are more likely to

cause severe pollution than the drilling blowouts because of the cased wellbore all down to the production zones. If the well blows out in such a completed well, the fluid blowing out can be water, gas, oil or condensate. Drilling blowouts mainly result with gas blowout.

Workover blowout is the end result of well integrity loss due to loss of the well barriers, primary and secondary ones, described in detail by Holand (1997) and Bellarby (2009). *Primary barrier* is defined as a barrier which has a task to stop unpredictable fluid flow (examples: wellbore fluid, tubing, x-mass tree valves). *Secondary barrier* presents a primary barrier backup (examples: downhole safety valve, tubing hanger, wellhead). Secondary barriers have to be independent of the primary barriers in case of failure of the latter. Swabbing, low fluid column weight, trapped gas, low cement preflush weight or bullheading are considered to be the main causes for the primary barrier loss within the wellbore operations like pulling the wellbore equipment out of the hole, installing the equipment, perforating, pressure testing, circulation, snubbing operations or well abandonment. Secondary barrier is mainly lost within unavailability or failure of string safety valves, kelly stabbing failure, BOP activation failure, insufficient frictional back pressure and annulus valve or casing head failure (Holand, 1997). Therefore, occasional pressure testing of wellbore equipment is essential if barrier losses are to be avoided.

Well barriers during the workover operations are basically the same barriers that exist during the drilling processes. But, there are some differences. Workover fluids, for example, are usually solids-free and they are free to escape into formation in open hole production systems without the mud cake formed on the wellbore wall, which is not the case in drilling operations.

Well Integrity Management System (WIMS) is one of the risk assessment approaches used to describe the status and handle the well integrity issues (Corneliussen, 2007; Al-Ashhab et al., 2004;

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