

Our disabling road accident – lessons relevant to process industries

Chris Arthey, Consultant, White Cottage, Clock Barn Lane, Hydestile, Surrey GU8 4AZ

Chris and Denise Arthey both lost their left legs above the knee in a road accident in 2008. They were motorcycle touring in South Texas when they were hit almost head-on by a drunk driver who veered across the road at 80mph. Several features of the accident have direct relevance to safety in the process industries: inherently unsafe design; variable operator competence; acceptance of fatalities as routine; lack of intervention. The drive to work should provide a case study and an inspiration for building safety into process design and operation.

Introduction

It's been said that all the best talks are part information, part inspiration. That's how we'd like to structure our remarks today. We'll first give you the information on what happened to us; you can see from Photograph 1 that there is a story to tell. Then we'll cover the inspiration part: what lessons can be learned from this story and, in particular, how can they be applied to the subject of this conference: improving process safety performance?



To complete our introductions, I recently finished my 'first career' as an engineer in the oil and gas industry. For a good part of my 40 years in the business I worked on the front-end development of new upstream projects. The last eight years were overseas: five years in the USA and then three in the Middle East. Denise was a school teacher, and we'll share the speaking.

Our disabling road accident

Let's talk about motorcycling. I was on a motorcycle on my sixteenth birthday, the youngest you can legally ride in the UK. One of my ambitions was to ride road trips in the USA, so when we moved to Houston on assignment in 2007 this was on my priority list. Photograph 2 was taken the evening before our accident. The machine was a Harley-Davidson Road King, with a 110 cubic inch (1800cc) engine and six forward gears. We were preparing for a short touring vacation in South Texas down towards the Mexico border.



The following day, on 16th May 2008, after a break for lunch, we were riding on Highway 35. This is a straight single carriageway, and we were about an hour away from Corpus Christi which was our destination that day. At 2:34pm, in an instant, everything changed. We don't have any recollection of the accident, but there was a reconstruction over a year later in a Texas courtroom.

I had been riding at about 55mph with Denise on the pillion. The speed limit was 70mph. A young driver in a Ford F150 truck came up behind us then overtook. He had just completed his overtaking manoeuvre when he noticed a red SUV approaching at high speed on the wrong side of the road. At the last moment to avoid a collision he drove off the road. He said 'the motorcyclists were right behind me – I didn't give them a chance'. So now I could see the red SUV, which was approaching at 80mph. With a combined closing speed of 135mph things are happening at 60 metres/second, and the red vehicle hit us virtually head-on. A white Chevrolet truck was following a few car lengths behind. The driver's wife described seeing an explosion of motorcycle parts, with two bodies flying through the air like rag dolls. The red vehicle swung back into the correct lane but then veered across again and collided with the white truck, severely injuring the driver and his wife.



Photograph 3 shows the red vehicle that hit us. The car had caught fire; the driver was badly injured but was rescued. The marker paint on the grass was sprayed by the police in anticipation of a fatal accident inquiry. Photograph 4 is the white truck that was behind us. Although the driver had hit the brakes, the impact was still severe. The fence behind the truck is about 20 metres from the roadway. In the distance you can see two figures standing over what was left of the motorcycle. Photograph 5 shows the Road King on the grass, again with the marker paint. This side of the machine was relatively undamaged. Photograph 6 is of the motorcycle on a recovery trailer. The left front fork has gone, the left pannier and exhaust pipe are gone, the crash bar is bent back against the engine. This is the side where our legs were. Incredibly, everyone survived the accident.

The driver of the red SUV was found to have had a blood alcohol content of 0.25% (more correctly 250mg/100ml), which is just over three times the USA and UK drink-drive limit of 0.08%. This is the equivalent of 2 to 2.5 bottles of wine or about 0.5 litre of whisky. For context, 0.35% blood alcohol content is the equivalent of a hospital general anaesthetic. After the collision I wasn't aware of much for some weeks, so I'll let Denise take up the story.

The truck driver behind us said that Chris had less than half a second to react. We were both terribly injured, and were taken in two separate helicopters to the nearest trauma hospital at Corpus Christi. Chris had a badly crushed left leg and foot, a broken left arm and hand, a ruptured spleen, broken ribs, a punctured lung and heavy concussion. He spent 3 weeks in Intensive Care, most of it in a medically-induced coma. I had a crushed leg that had to be amputated straight away, a broken left arm and tendons in my left hand, my left arm was 'degloved' and I had damage to my remaining ankle. I also had concussion. I spent ten days in Intensive Care.



Photograph 7 shows Chris two days after the accident. He was on a ventilator, and at this point he still had the left leg which was in traction. However, they were unable to save the leg and after ten days our eldest son and I signed the papers for amputation.

As soon as the news of the accident broke, Chris' employer arranged to have our three youngsters flown over from the UK (they were 25, 22 and 18 years old at the time and working or studying in England). They stayed at Corpus Christi until we were both out of danger. After a month we were well enough to be transferred to a rehabilitation hospital nearer to our home north of Houston. We did lots of physical and occupation therapy. Photograph 8 shows us with weights on our good legs, starting to build them up ready to walk again. We both had further arm surgery. We were both home by mid-July, two months after the accident.





Photograph 9 is of Chris shortly after he arrived home. His weight had fallen to 53kg (less than 8½ stone). You can see the scar on his abdomen where his spleen was removed. The bandage on his right thigh covers the donor site for the skin graft that was used to patch missing skin on his residual limb (or ‘stump’). I had one of those too, with skin taken for my stump and also for my left arm.



Photograph 10 is a happier one, with both of us at home. The skin graft on my degloved left arm was still quite fresh, but taking well. We continued with therapy as out-patients, and around the four month mark we were fitted with our first prosthetic legs and had to learn to walk all over again. When Chris could walk 50 metres with a walking stick they let him back into work part-time. Out-patient therapy lasted until about nine months, then we had a further year of chiropractic therapy for our spines to correct damage caused by landing on our heads.

Lessons relevant to process safety performance

That describes what happened to us, the information part of our presentation. Now let’s turn to the inspiration part: some features of this accident that are of relevance to process safety.

Inherently unsafe design

Many of our roads are inherently unsafe; they present a high level of hazard with little control from protective systems. Take for example Highway 35 that we were travelling on. It’s a single carriageway (in the US these are called ‘two-laners’); the type that constitutes most of the road miles in the UK network. These undivided highways carry vehicles in opposite

directions and in close proximity, often at high speeds. Closing speeds in excess of 100mph are commonplace, with little room for error. Add bends, junctions, uneven surfaces, varying weather conditions, night as well as daytime use, and a range of road users including the occasional horse, and it's not surprising that 60% or more of UK road deaths happen on such roads. Vehicle designs improve all the time, but it's asking a lot of seat belts, crumple zones, air bags and safety compartments to protect us against the sort of forces that errors on these roads can generate.

In the process industries, engineering practitioners who design processes and plants aim for inherent safety; to build safety in right from the start. The aim is a low level of danger even if things go wrong. What we see on many of our roads shows how difficult it is to retrofit safety. If engineers were able to start again and design a safer road network, it wouldn't look anything like these roads. But, as they say, 'you can't get there from here'.

Variable operator competence

How about driver competence? I like to think I'm a good driver. Most of us do. I passed my motorcycle test in 1972 when an examiner watched me ride round the block, and I passed my car driving test in 1973. The driving test was somewhat more rigorous. But the only further training I've had in the 40+ years since has been voluntary: defensive driver training, advanced rider training with the motorcycle police and skid pan training. Other than that elective tuition, and the cameras, nobody is really holding me accountable or correcting any bad habits I've developed as a vehicle operator. I truly hope I'm a good, safe, defensive driver.

The top cause of road accidents is distracted driving; driving with reduced attention. It's easy to see driving as a low-grade task. Pretty much everyone drives. It's not that difficult. It becomes routine, it can get boring, and we become complacent. We lose sight of what could possibly go wrong on the road. So we fill up our attention space with other things: we listen to the radio, we chat, we eat and drink. It's easy to develop bad habits. We change the music, the phone is tempting. We rationalise to ourselves that it's OK to drive if we're a bit tired, or if we've only had a couple of drinks; that it's OK to speed up a bit if I'm in a hurry and my mind is on where I want to be. Maybe we feel concerned at first, but after a few times it bothers us less. Soon the bad habits become routine, almost without us realising. We see the results when we are out on the roads. Distracted drivers don't use their mirrors as much. They change lane without using their indicators, or without checking properly. They break speed limits. Some use mobile phones, send text messages, re-programme their satnavs, tailgate, drive when drowsy, shoot lights, drive when drunk (I'm sure none of us here today has ever done any of these terrible things). Many of you will recall the 10 August 2016 collision on the A34 near Newbury, where a professional lorry driver crashed into stationary traffic at 50mph, killing a mother and three children. He was scrolling through music selections on his mobile phone and had barely looked at the road for 45 seconds before the impact.

In the process industries, if a decision is made to proceed with a design that includes residual hazards, risks can be mitigated or controlled by protective measures. These measures include operators who are only allowed control when they are highly trained in identifying and managing departures from normal operations. Continuing training is used to maintain standards, to reinforce good habits and to avoid bad habits developing. There is a culture of risk awareness and intervention.

We're careful to automate where we can. I should make a comment about the development of autonomous or self-driving vehicles. There are indeed rapid developments, from parking assistance and lane-keeping through to fully autonomous cars. However, it will be some years before the technology could become commonplace enough to make our roads significantly safer. In the meantime, regulators are faced with a balance between increased training, education and verification with penalties for non-compliance, and concerns of over-regulation or restriction of freedoms. In my opinion this balance is skewed because road accidents are tacitly accepted as routine.

Tacit acceptance of road deaths as routine

UK roads are among the safest in the world. In terms of deaths per distance travelled, they are about twice as safe as US roads. However, there are still about 1,800 road deaths in the UK each year, or around 5 a day. These are deaths; fatalities. There is a much larger number of accidents with injuries, many of them permanently disabling like ours.

Despite this toll, deaths on UK roads rarely make national news. You may recall a five-day period in August 2016 when there were 12 drowning deaths off UK shores, five of them in a single incident at Camber Sands. This was widely reported at the national level and was front-page news on several papers. During the same period there will have been about 25 road deaths, with comparatively little coverage. The A34 crash I mentioned earlier was an exception, but it only became big news a few weeks later when the lorry driver went to court and some very disturbing dashcam videos were released showing him using his mobile phone right up until the impact. Road deaths seldom sell national newspapers.

This tacit acceptance of road deaths makes it difficult to build or maintain a culture of road safety. If you speak to the traffic police or emergency services you will find that they have a high awareness of what can go wrong on the roads and the consequences. However, I'm not sure you find the same awareness in the average daily car commuter on our roads.

The figure of 1,800 road deaths a year compares to about 150 worker deaths per year in UK industries. The process industries are to be applauded for achieving a comparatively safe culture, with higher safety awareness and reduced tolerance of accidents. It takes relentless focus, and Hazards 27 is just one aspect of this mission. Nobody should get hurt at work.

Lack of intervention

Intervention is a critical aspect of a safety culture. In the case of our accident, the drunk driver that hit us was trying to drive home from a fishing trip. We know that he was seen drinking heavily on the boat earlier in the day. People will have seen

him going to his car to drive home. Witnesses in the courtroom reported how they had seen him driving erratically, at wildly varying speeds and on both sides of the road, for several miles before the accident. Yet nobody did anything. Nobody stopped him. Nobody called the emergency services. Why is that? Why is it so hard for us to intervene?

The answer is probably found in an old proverb that says 'Fear of man will prove to be a trap'. It's true; we might see something dangerous going on but we're frightened of what people might say, what they might think, what they might do. So we keep our opinions to ourselves. Maybe we get lucky. Maybe we get away with it, this time. But if we let an unsafe condition continue, if we don't intervene, then sooner or later, after so many road miles, there will be a bullet in the chamber. The accident happens, and lives are changed forever. If you're in a car where the driver is distracted then say something. You don't want to be responsible for something like this happening. Or worse.

You're familiar with a positive intervention culture in the workplace. You'll also be well aware that it's much easier to talk about it than to do it. It takes a lot of courage, a lot of assurances that intervention will be applauded, and absolute adherence to those assurances. But it's worth it; every decision to intervene is a decision for safety.

Conclusion, and a happy ending

We'd like to summarise by pointing out that your drive to work should provide you with a daily case study on what to avoid as you strive to reduce risks in process design and operation. You will routinely see inherently unsafe design and variable operator competence. Watch out for an acceptance of accidents as routine, and remind yourself how difficult it is to make effective interventions to improve safety.

Unlike many road accidents and safety incidents, our story does have a happy ending. We both survived, and we'll shortly be celebrating our 38th wedding anniversary. Before the accident I was a keen marathon runner, and within two years I took delivery of my first running leg, as you can see in Photograph 11. At first I could only run about 50 metres before I was out of breath and had to stop, and I fell over a lot. But after a year of training I could run 5km without a walking break. Photograph 12 shows my cycling leg, which has a freewheeling knee. I also learned to swim again. As an amputee, or 'para-athlete', I've competed in about ten half-marathons, one full marathon, and twenty triathlons including three at Olympic distance, all against able-bodied competitors. In 2016 as a 60th birthday and retirement project I climbed Kilimanjaro with one of our sons. Photograph 13 was taken on Day 4 of the trek, at the top of the Barranco Wall, and Photograph 14 was at the summit, on Day 5.





As you heard, Chris completed his first career and we're now busy on other things. We work together on presentations like this one, we both test prosthetic legs for a leading UK manufacturer, Chris is studying for an MSc in Biomedical Engineering, and I'm volunteering back in the school where I used to teach before we went to the USA. We're back near our family, and every day for us is a gift.

<https://www.utdallas.edu/partyfoul/risks/>

http://www.drinkdriving.org/worldwide_drink_driving_limits.php

<http://www.independent.co.uk/news/uk/home-news/britains-10-deadliest-roads-revealed-8901269.html>

<http://www.hse.gov.uk/statistics/pdf/fatalinjuries.pdf>

<http://www.rospa.com/road-safety/advice/road-users/rural/>

<http://www.bbc.co.uk/news/uk-england-37823457>

<https://www.theguardian.com/uk-news/2016/aug/24/men-dead-pulled-from-sea-camber-sands-sussex>