

Obfuscation and An  
Explosion at the BP Refinery in  
Texas City, Texas

On March 23, 2005 at approximately 1:20 p.m., an explosion occurred in the isomerization (ISOM) unit at the BP petroleum refinery in Texas City, Texas. That explosion and associated fires killed fifteen people and injured at least one hundred and eighty more (1.).

The purpose of this report is to review some of the facts related to the March 23<sup>rd</sup> incident in the context of a particular air emission control regulation administered by the State of Texas.

The Isomerization Unit

The ISOM unit is an integral part of the BP refinery at Texas City. Simply stated, the ISOM unit accepts a feed stream composed of a liquid mixture of n-pentane and n-hexane and converts that feed to isopentane and isohexane. Those two hydrocarbons are then used as raw materials in other parts of the refinery.

The part of the ISOM unit that was the source of the hydrocarbon release that ultimately exploded on March 23<sup>rd</sup> was the raffinate splitter (E-1101) and the ISOM unit blowdown drum (F-20) (2.).

Note that the ISOM unit blowdown drum was equipped with a one hundred and thirteen foot stack that discharged directly to the atmosphere and a "goose-neck" outlet that discharged to the refinery sewer system (3., 4.).

Note also that the blowdown system at the ISOM unit has been judged to be antiquated and unsafe (5.).

The explosion occurred as a result of the inadvertent development of dangerously elevated pressure in the raffinate splitter (E-1101) and the raffinate splitter overhead vapor line. The elevated pressure caused the uncontrolled flow of hydrocarbon vapors and liquids to the blowdown drum (F-20) and the subsequent release of those hydrocarbon vapors and liquids to the atmosphere, the ISOM unit concrete pad, and the refinery sewer system.

For a complete rendition of the details of this catastrophic accident, see reference documents 1., 2., and 18.

### The Construction – Operating Permit Process

In the early 1970's, the Texas Air Control Board (TACB), a state agency created for the purpose of developing, implementing, and enforcing air pollution control regulations, established a permit system meant to limit atmospheric emissions from new or modified industrial facilities. Originally, known as Regulation VI, the rule required that an entity that intended to construct any new facility or modify any existing facility that would emit an air contaminant into the atmosphere or change the nature of air contaminant emissions into the atmosphere (in the case of a modified facility) must first obtain a construction permit from the TACB.

In order to obtain a construction permit, the facility proponent had to file a permit application with the TACB. Among other things, the application had to detail the kind and quantity of air contaminants that the facility operator intended to emit into the atmosphere from each and every emission source in the proposed facility (6.). The primary purpose of that requirement was to generate the information needed to judge the impact of proposed air emissions on the health and welfare of the surrounding community.

Once a construction permit was issued, and the permitted facility was built and started up, then the facility proponent had to file an application for an operating permit.

In order to obtain an operating permit, the applicant had to demonstrate that the facility was built in a manner consistent with the relevant construction permit and associated application.

#### Air Emission Permits and the ISOM Unit

Over the last three decades, BP has submitted numerous construction and operating permit applications to the State regulatory agency. The first relevant application was designated C-3170 (7.). Construction permit application C-3170 involved the construction of a “heavy ultraformate fractionator” (E-1101), a “reflux drum” (F-1102), and various associated equipment in the No. 1 ultraformer unit of the refinery. The heavy ultraformate fractionator was ultimately converted to the raffinate splitter (apparently without the required regulatory agency permit). There was no indication in the application that either the raffinate splitter (E-1101) or the reflux drum (F-1102) would be vented to a blowdown drum.

In January 1985, BP filed a “special exemption” request to convert the refinery Ultraformer #1 unit to an isomerization unit (the isomerization unit was the process facility in start-up mode on the day of the explosion). That request was granted by permit exemption X-16167 dated November 5, 1986 (8.).

In 1991, an application for continuance of Permit R-3170 (R designates an operating permit) was filed on behalf of the Texas City refinery operator (9.).

Neither permit application C-3170, nor special exemption request X-16167, nor permit continuance application R-3170 contained the required disclosure of detailed engineering information to indicate that the raffinate splitter (E-1101) and a variety of process equipment in the isomerization unit could or would be vented to an atmospheric blowdown drum (F-20).

The failure to disclose the existence of the blowdown drum (F-20) and its association with the raffinate splitter (E-1101) and the isomerization unit apparently continued through the day of the subject explosion. That failure included interactions with the TCEQ related to BP's more recent efforts to obtain a so-called flexible permit for the ISOM unit and other parts of the Texas City refinery.

It must be emphasized that those repeated failures to identify the blowdown drum (F-20) as an air emission source constituted violations (perhaps including criminal violations) of the rules and regulations of the State of Texas air emission control regulatory agency. Furthermore, it is important to understand that, in all probability, the failure to disclose the existence of the blowdown drum (F-20) was well thought out by BP personnel. An indication of that is the existence of at least two different sets of isomerization unit plot plans (10., 11.) and two different sets of process flow diagrams related to the raffinate splitter (12., 13.) and the isomerization unit (14., 15.), all created by or on behalf of BP. The plot plants and process flow diagrams that failed to identify the blowdown system were incorporated into air emission regulatory agency submittals. The plot plans and process flow diagrams that clearly delineated the existence of the blowdown system were withheld. The motivation for that chicanery was clearly the love of money (16., 17.).

#### Some Technical Aspects of the Blowdown System

The blowdown drum (F-20) was first constructed in the 1950's. It was a vertical drum, ten feet in diameter, equipped with a one hundred and thirteen foot high stack (18.). The use of the blowdown drum was highly questionable in terms of good engineering practice. American Petroleum Institute standards indicate that similar systems might be safely operated if environmental regulations permit such discharges (emphasis added), and if careful attention has been paid to the air pollution consequences of said operating practice (19.). BP Refinery engineering specifications stated that new blowdown systems, which discharged directly to the atmosphere, were not permitted (20.).

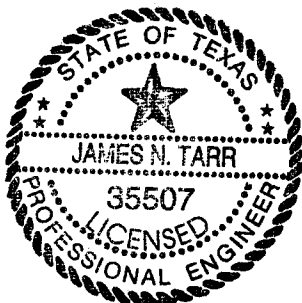
Furthermore it was documented by BP personnel that the blowdown drum (F-20) could have and should have been modified to discharge to a flare (instead of directly to the atmosphere) on at least two occasions. The first of those two occasions was 1995, when a new flare system was installed in the refinery Aromatics Unit No. 2. The second occasion was in 2002, when the refinery Naphtha Desulfurization Unit flare line was moved to a place in close proximity to the blowdown drum (F-20) (21.).

Finally, it must be noted that BP personnel clearly recognized that explosion and fire was an ongoing threat at the blowdown drum (F-20) (22.).

### Conclusion

The blowdown drum (F-20) was apparently the source of the hydrocarbon emission that resulted in an explosion and fires at the BP refinery in Texas City on March 23, 2005. That piece of equipment was operated in violation of the State of Texas air emission control regulations for approximately thirty years prior to the explosion. It was operated contrary to American Petroleum Institute standards. It was operated contrary to BP corporate engineering guidelines.

Given the numerous times that refinery personnel had an obligation to identify the blowdown drum (F-20) as an air emission source, and given the multiple failures of refinery personnel to modify the operation of the blowdown drum (F-20) to eliminate the hydrocarbon discharge to the atmosphere, it must be concluded that failure to reveal the existence of the blowdown drum (F-20) and its method of operation to the responsible State of Texas air emission regulatory agency was a deliberate failure on the part of refinery decision makers. It is clear that had the F-20 blowdown drum been replaced with a flare system, the March 23, 2005 explosion probably wouldn't have occurred.



Jim TARR  
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## References

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2. "Fatal Accident Investigation Report – Isomerization Unit Explosion, Final Report," John Mogford, December 9, 2005, pp. 12 – 14.
3. Drawing B-4550-G-2399, "Isomerization Unit UFD Blowdown Drum/Pump-Out Pump and Cooler," date unknown.
4. Drawing C-4550-180, Ultraforming Unit #1, Engineering Flow Diagram, Relocation of Blowdown Drum, 10-18-55.
5. CSHIB, page 21.
6. Over the last thirty-five years, the name of the State of Texas regulatory agency and the applicable permit rule designation has changed several times. The current agency name is the Texas Commission on Environmental Quality (TCEQ); the current rule designation is 31 TAC 116.
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9. Permit (R-3170) Continuance Application Fractionator/Splitter Unit, Submitted by Amoco Oil Company, Texas City, Texas, Prepared by Radian Corporation, May 1991.
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11. "Isomerization Unit No. 1, Figure 1-3, Unit Plot Plan," Amoco Oil Company, prepared by Jones and Neuse, Inc., 6-10-94.
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13. "Xylene Recovery Expansion at No. 1 and No. 2 Ultraformer," Drawing R-4550-893, Amoco Oil Company, prepared by Bovay Engineers, Inc., 8-4-75.
14. "Isomerization Unit P. & I.D., Ultrafiner Section Light Ends Stripper," Drawing D-4550-G-1355, Amoco Oil Company, 1-24-85.
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17. BP email, Walt Wundrow to Gary M. Scoggin and David B. Arnett, Subject: Line Size for NDU Flare, January 09, 2002.
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19. "Guide for Pressure-Relieving and Depressuring Systems," API Recommended Practice 521, Fourth Edition, American Petroleum Institute, March 1997, page 32.
20. "Process Safety Standard No. 6," Amoco Petroleum Products, September 20, 1977.
21. Mogford, Final Report, p. 109.
22. "Isomerization Unit HAZOP Item No. 14 Resolution," no author, no date, Bates BPISOME00331836-BPISOME00331850, see page 5 of 10.