A Reverse Case Study of Mechanical Failures

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Abstract

Unlike a conventional case study, where a single scenario is developed by an instructor and students then analyze that scenario, a *reverse* case study involves the students in the development of multiple scenarios. This paper describes how approximately fifty student teams in a sophomore-level engineering course were presented with fifty physical components that had experienced mechanical failures. Each team was asked to select three components, classify the failure mode and develop a unique case study involving all three components. The students had trouble correctly identifying failure modes, because this was probably their first attempt at failure analysis, but the experience was motivational because it involved real-life components and creative writing.

Introduction

A *reverse* case study was used in the sophomore-level *Materials Testing* course at Missouri University of Science and Technology (Missouri S&T) during the spring semester of 2012. This one-credit-hour laboratory course accompanies the mechanics of materials course required of many engineering majors. The inspiration for this unique type of case study came from Deborah A. Beyer[1] in the Department of Nursing at Miami University. Professor Beyer presents her students with a list of medications and asks them to deduce a patient's medical condition and then develop a care plan. At Missouri S&T, students were asked to analyze broken components and then develop a scenario involving all of those components and their associated failure modes. Figure 1 shows some of the components that were made available to the students. Appendix A contains a photo and short description of each item.

The term reverse is sometimes used to describe case studies on *what not to do*. Students would be encouraged to not repeat the unfortunate situation described in the case study. Highly publicized building collapses, stemming from an engineering or construction mistake, might be used in this type of case study. In this paper, however, the term reverse has more to do with the manner in which the case study is created than the subject of the study.

Instructors often have to edit or replace a case study after one or two semesters in order to avoid plagiarism, but a reverse case study results in a unique case for each student team, which reduces the risk of future teams being able to copy that work. Plagiarizing a reverse case study would require pre-planning—selecting an old study ahead of time, identifying the components used in that study and then selecting the same components during class time—instead of copying after the assignment has been given.

Figure 1. Reverse Case Study Components

Reverse case studies may contain fewer details, because they are authored by students instead of an instructor, but they may be more engaging. The reverse scenario utilizes the students' own life experiences, gives the students a greater sense of ownership in the assignment, and forces them to spend more time in the *synthesis* level of the Bloom's cognitive domain.[2] As in this paper, the reverse case study may also give each student more exposure to physical evidence. Instead of a virtual experience or limited physical evidence, each student gets to see/touch/taste/smell/hear several real-life items.

Background

A reverse case study was added to the existing *Failure and Fully Plastic Action* lesson—one of twelve week-long experiments in the course. The lesson objectives were (1) to enhance the student's understanding of the term *failure*, (2) to familiarize the student with the mechanical properties of ordinary carbon steel within the inelastic range, and (3) to demonstrate the use of three-point flexure equipment. An unspoken goal was to inspire curiosity in more advanced engineering topics, like stress concentrations, failure analysis and fractography.

Students were asked to perform a flexure test, combine that data with data from three previous experiments performed on the same material, and compare the combined results to the maximum shear stress theory, maximum octahedral shear stress theory, maximum principal strain theory, and maximum principal stress theory. In previous semesters, student teams presented their findings in a memo or report format. In the new assignment, they were asked to submit a worksheet summarizing their experimental findings and the reverse case study, as a substitute for report writing. The total amount of effort was intended to be about the same.

The components used in the case study were collected over a 15-year period, with students contributing one-third of the components. The author liked to use real examples in his classes, and several of his students thought enough of the educational experience to contribute examples of their own, sometimes years after they had graduated.

In the fall semester of 2010 through the fall semester of 2011, students were asked to pick one of seventeen components and identify the component's failure mode. Randomly selected students were then asked to refine their choice of failure mode based on Risk in Early Design (RED) software being developed by Grantham et al.[3] Results from this investigation were recently published by Arlitt and Grantham.[4] During the summer and fall semesters of 2011, additional components were cataloged and photographed. This expanded collection was made available as part of the reverse case study in the spring semester of 2012. The author has many more components that will be added as time allows.

Method

A total of 147 students in eight laboratory sections were divided into 49 teams of three. Fifty-two components was made available to the student teams during the class period, and high resolution photographs of each item were made available on the class web site so the students could continue their investigations outside of class.

Each student team chose three failed components and then tried to determine the mechanical failure mode for each component using the failure taxonomy[5] provided in Appendix B. The taxonomy contained a list of primary identifiers, failure modes, and definitions. It was chosen because of its integration with the RED software. This was most likely the first time the students had seen a failure taxonomy, and while they may have heard of terms like fatigue and creep they were probably unfamiliar with the exact definitions.

As an inquiry-based learning experience, the students did not receive instruction in how to perform a proper failure analysis. They also had limited or no exposure to manufacturing processes, materials science, fractography, non-destructive testing, etc. References for some of these areas were provided, but it was left to the students to pursue them.

The students were asked to make an initial selection of failure modes before leaving the lab and then include a final selection a week later in their submitted case study. Table 1 shows how the available components matched the taxonomy, as judged by the course instructors. It should be noted that one of the components—a spinal fixation system—did not exhibit a mechanical failure and therefore could not be mapped to the taxonomy.

The students were asked to craft a short narrative involving all three components and how their failures were related. It was suggested that the stories be modeled after a news report, but the exact format was left up to the students. Portions of four submissions can be found in Appendix C.

Results

The students submitted 49 case studies. The instructors graded and accidentally returned 13 of the studies before they could be logged, but data from the remaining 36 studies is provided below. These studies involved 105 failure assessments on 36 of the 52 available components. It is only by coincidence that the data is from 36 studies involving 36 components.

The most commonly selected components are listed in Table 2. The numbers represent the percentage of teams that chose each particular item. It seemed that the students were more apt to select objects that they could identify and/or that had a more discernible function. Obviously,

Table 1. Instructors' Failure Classification for Full Collection

Primary Identifier	Percentage of Components	Failure Mode	Percentage of Components
buckling	--	--	--
corrosion	2%	corrosion fatigue	2%
creep	--	--	--
ductile deformation	8%	brinelling yielding	2% 6%
fatigue	8%	high cycle fatigue	8%
fretting	--	--	--
galling & seizure	16%	galling	16%
impact	14%	impact deformation impact fracture	2% 12%
radiation	--		--
rupture	51%	brittle fracture ductile fracture	24% 27%
spalling	--	spalling	--
wear	2%	abrasive wear	2%

knowing how a component is used, where it fits in a larger mechanism, approximately how it is loaded, its service conditions, etc. would make that component easier to examine and to write about. Components that were not chosen included bolts, shafts, a harmonic balancer and a clutch master cylinder.

Table 2. Most Commonly Selected Components

Teams that Selected Component	Component Description	Teams that Selected Component	Component Description
33%	bowling ball*	11%	needle-nose pliers
25%	highway sign hardware	11%	frozen water pipe*
19%	racquet*	11%	helicopter rotor blade
19%	transmission gear cluster*	11%	lawn mower engine*
17%	Corvette steering mechanism	8%	porch swing hook#

* components donated by students; # component involved in legal case

The students concluded that the 36 components exhibited the primary indicators and failure modes listed in Table 3. The percentages in the table represent how often the primary identifier or failure mode was chosen. As a comparison, the table also shows the instructors' choices for these 36 items. The largest discrepancies between the students' and instructors' opinions involved *galling* and the various forms of *fracture* described in the taxonomy.

The students and instructors agreed upon the primary identifier in 39% of the 105 investigations. The components with the highest level of agreement included a helicopter rotor (100%), frozen water pipe (100%), splined shaft (100%), bowling ball (88%), racquet (79%), CO_2 bottle (66%) and porch-swing hook (66%).

Table 3. Comparison of Student and Instructor Choices

Primary Identifier	Student Choices	Instructor Choices	Failure Mode	Student Choices	Instructor Choices
buckling	1%	--	buckling	1%	--
corrosion	6%	3%	corrosion fatigue	3%	3%
			direct chemical attack	1%	--
			erosion corrosion	2%	--
creep	7%	--	stress rupture	4%	--
			creep	2%	--
			creep buckling	1%	--
ductile deformation	5%	10%	brinelling	1%	3%
			yielding	4%	6%
fatigue	15%	7%	high cycle fatigue	10%	6%
			impact fatigue	1%	--
			surface fatigue	3%	--
			thermal fatigue	1%	--
fretting	--	--	--	--	--
galling & seizure	--	21%	galling	--	17%
impact	36%	17%	impact deformation	8%	3%
			impact fracture	25%	11%
			impact fretting	3%	--
radiation	--	--	--	--	--
rupture	24%	41%	brittle fracture	15%	29%
			ductile fracture	8%	23%
spalling	1%	--	spalling	1%	--
wear	5%	--	abrasive wear	3%	--
			corrosive wear	1%	--
			impact wear	1%	--
			surface fatigue wear	1%	--

The students and instructors agreed upon the failure mode in 27% of the 105 investigations. The components with the highest level of agreement in this area included a splined shaft (100%), bowling ball (79%), helicopter rotor (75%), porch-swing hook (66%), frozen water pipe (50%), axle (50%) and socket (50%).

Surprisingly, only 19% of the teams revised their initial decisions after being given a week to become more familiar with the taxonomy vocabulary and definitions. During that week, 6% of the teams picked new components. It is assumed that they did not examine these new components during class time but decided to switch in order to enhance the narrative of their case study. This was not anticipated, so the instructions had not specifically forbidden it.

In the case study narratives, 26% of the teams used generic terms instead of the taxonomy vocabulary. For example, three teams described failures as being due to *pressure*, *rust* and *temperature*. Other teams appeared to use terms from the taxonomy without paying attention to their definitions. For example, none of the teams that selected *stress rupture* as a failure mode mentioned *creep*, even though creep is the primary identifier for stress rupture. These teams may have assumed that *stress* and *rupture* accurately described their components, without giving any thought to the primary identifier. Granted, this was a sophomore-level course, so terms such as creep and galling were probably very obscure, and that contributed much to the misused or missing terminology.

The originality of the case study narratives was excellent. It appeared that the students put more effort into creating an engaging scenario than accurately identifying failure modes. Some of the case studies were serious while others were comical. Curiously, several of the scenarios revolved around alcohol and dating relationships. In straw polls conducted by the author, several students mentioned that they enjoyed the change in format compared to their typical laboratory assignments.

Google Analytics was used to measure how often and how long content on the class web site was utilized. Figure 1 shows how many hours each lesson was utilized that semester. The *Failure and Fully Plastic Action* lesson was by far the most utilized, with 121 hours of usage and 8560 page views. Average lesson usage was 46 hours.

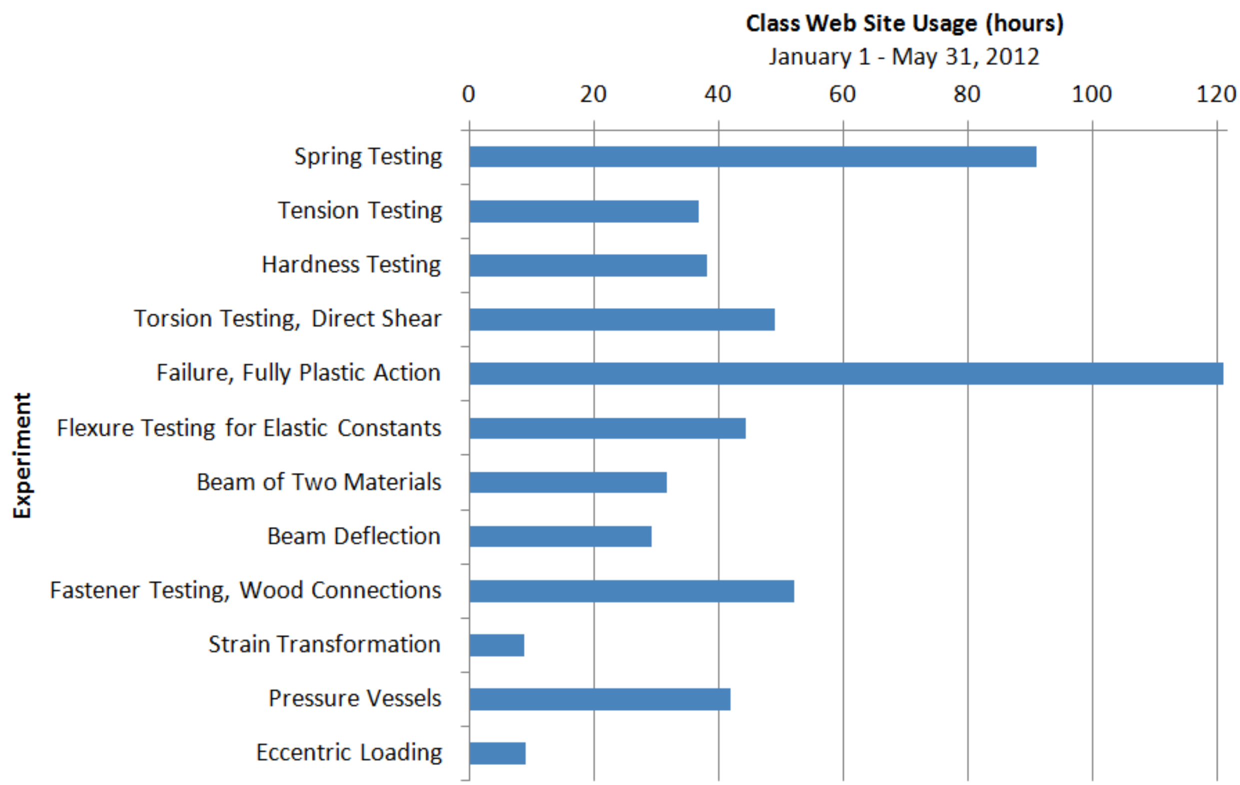

Figure 1. Hours of Online Lesson Usage

Conclusions

The students seemed to enjoy the reverse case study, partly because it involved real components and partly because the writing style was so different from traditional engineering assignments. The students wrote short case studies involving multiple failures and how those failures were related. Their creativity was impressive. Their ability to correctly identifying failure modes was lacking, but the course instructors were satisfied with what was probably their first attempt to analyze mechanical failures. Based on Google Analytics data, the assignment was the most engaging of the semester.

In future semesters, the instructors plan to put more emphasis on the failure definitions. They might also include a checklist of questions, like “Is the item fractured?” or “Does the item show signs of yielding?” to help lead the students through the investigation. Teams will not be allowed to switch components once they leave the laboratory.

Hopefully, students that complete this assignment will come away with a better understanding of failure and the many ways it can occur. Their interest in failure analysis can then be more fully developed in later courses on machine design, fatigue analysis, fracture mechanics, etc. Faculty teaching these courses at Missouri S&T and elsewhere are welcome to use the component photographs found on the Materials Testing web site.[6]

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Bibliography

1. Beyer, D. A. (2011). Reverse case study: To think like a nurse. *Journal of Nursing Education*, 50(1).
2. Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: the classification of educational goals. *Handbook I: Cognitive Domain*. New York: Longmans, Green.
3. Grantham Lough, K., Stone, R. & Tumer, I. (2009). The risk in early design method (RED). *Journal of Engineering Design*, 20(2), 155-173.
4. Arlitt, R., & Grantham, K. (2012). A hybrid problem-based and just-in-time teaching method for failure analysis instruction. *International Journal of Engineering Education*, 28(3), 1-9.
5. Uder, S. J., Stone, R. B., & Tumer, I. Y.. (2004). Failure analysis in subsystem design for space missions. International Conference on Design Theory and Methodology. Salt Lake City, UT.
6. Thomas, J. (2012). Class notes. Retrieved 21 June 2012 from http://classes.mst.edu/ide120/lessons/failure/index.html

Biographical Information

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Appendix A: Full List of Components


lawn mower piston


harmonic balancer


lawn mower piston


automotive piston


lawn mower engine


motorcycle piston


lawn mower piston


lawn mower piston


lawn mower piston


splined shaft


axle


transmission


transmission


half shaft


axle


drive shaft


sway bar


steering


strut


winch


lab specimen


CO_2 bottle


water pipe


air nipple


potato cannon


clutch master


spine fixation


highway sign


bolt, tension


bolt, direct shear


bolt, flexure


hook, tension


bridge bolt, tension


highway sign


bolts, direct shear


bolt, torsion


pliers


chuck


bolt fixture


handle

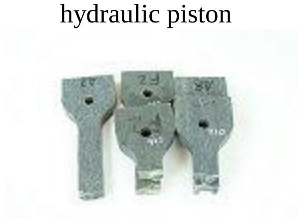

socket


hydraulic piston


tension grips


bowling ball


pedal


tension specimens


tension specimens


unknown


racquet


rotor


frame pivot


drumstick

Appendix B: Failure Taxonomy

Primary Identifier	Failure Mode	Definition
Buckling (High and/or point load geometric configuration)	Buckling	An increased deflection of a member after a slight change in load as a result of the geometrical configuration and the combination of magnitude and/or point of load.
Corrosion (Material deterioration due to chemical or electrochemical interaction with environment)	Biological corrosion	The corrosive process resulting from the food ingestion and waste elimination by microorganisms or macro organisms. The waste products of these living organisms act as corrosive media.
	Cavitation erosion	A form of chemical corrosion caused by differences in vapor pressure. Bubbles and cavities within a fluid collapse adjacent to the pressure vessel walls and cause particles of the surface to be expelled thereby baring the material below the surface to the corrosive medium.
	Corrosion fatigue	A failure mode in which corrosion and fatigue combine with each process accelerating the other. The corrosive process forms pits and surface discontinuities that act as stress raisers and accelerate fatigue failure. Cyclic loads or strains lead to cracking and flaking of the corrosion layer baring the material below the surface to the corrosive medium.
	Crevice corrosion	A form of corrosion that occurs within crevices, cracks or joints. Small volume regions of stagnant solution are trapped in contact with the corroding metal.
	Direct chemical attack	A common form of corrosion that occurs when the surface of the machine part exposed to the corrosive media is attacked more or less uniformly over its entire surface. The result is a progressive deterioration and dimensional reduction of load-carrying net cross section.
	Erosion corrosion	A form of chemical attack that occurs when abrasive or viscid material continuously flows past a surface thereby baring the material below the surface to the corrosive medium.
	Galvanic corrosion	Electrochemical corrosion of two dissimilar metals in electrical contact. Current flows through a connecting pool of electrolyte or corrosive medium and leads to corrosion.
	Hydrogen damage	Any damage to a metal caused by the presence of hydrogen or the interaction with hydrogen. Such damage includes hydrogen blistering, hydrogen embrittlement, hydrogen attack, and decarburization.
	Intergranular corrosion	A form of attack that occurs when the formation of galvanic cells precipitate corrosion at grain boundaries of copper, chromium, nickel, aluminum, magnesium, and zinc alloys due to the alloy being improperly heat treated or welded.
	Pitting corrosion	A form of corrosion similar to crevice corrosion leading to the localized development of array of holes or pits that penetrate the metal. The pit can be initiated by a small surface scratch, a defect, or a momentary attack due to a random variation in fluid concentration.
	Selective leaching	A form of corrosion in which one element is preferentially removed from an alloy to obtain a metal that is more resistant to the intended environment.
	Stress corrosion	Occurs when the applied stresses on a machine part in a corrosive media generate a field of localized surface cracks, which usually occur along grain boundaries.

Primary Identifier	Failure Mode	Definition
Creep (Plastic deformation)	Creep	Occurs when the plastic deformation in a machine member accrues over a period of time under the influence of stress and temperature. The accumulated dimensional changes eventually interfere with the ability of the machine part to satisfactorily perform its intended function
	Creep buckling	A delayed result of creep whereby an unstable combination of the loading and geometry of a machine part exceed the critical buckling limit.
	Stress rupture	Rupture into two pieces as a result of stress, time, and temperature. The steady-state creep growth period is often short or nonexistent.
	Thermal/stress relaxation	The relaxation of a prestrained or prestressed member due to the dimensional changes resulting from the creep process.
Ductile deformation (Ductile material)	Brinelling	A static force induced permanent surface discontinuity of significant size occurring between two curved surfaces in contact as a result of local yielding of one or both mating members.
	Force induced elastic deformation	Occurs when the imposed operational loads or temperatures in a machine member result in elastic (recoverable) deformation such that the machine can no longer satisfactorily perform its intended function.
	Yielding	Occurs when the imposed operational loads or motions in a ductile machine member result in plastic (unrecoverable) deformation such that the machine can no longer satisfactorily perform its intended function.
Fatigue (Fluctuating loads or deformation)	High cycle fatigue	The sudden separation of a machine part into two or more pieces occurring when loads or deformations are of such magnitude that more than 10,000 cycles are required to produce failure.
	Impact fatigue	Failure of a machine member by the nucleation and propagation of a fatigue crack that occurs as a result of repetitive impact loading.
	Low cycle fatigue	The sudden separation of a machine part into two or more pieces occurring when loads or deformations are of such magnitude that less than 10,000 cycles are required to produce failure.
	Surface fatigue	Pitting, cracking, and spalling of contacting surfaces (often rolling surfaces) that occur as a result of cyclic contact stresses and cyclic shear stresses below the contacting surface. The cyclic subsurface shear stresses generate cracks that propagate to the contacting surface and dislodge particles to produce surface pitting.
	Thermal fatigue	Occurs when fluctuating temperature fields in the machine part cause load or strain cycling to the point of failure of the machine part.
Fretting (Small amplitude fluctuating loads or deformations at joints not intended to move)	Fretting corrosion	Surface degradation of the material from which the part is made that occurs as a result of fretting action.
	Fretting fatigue	The premature fatigue fracture of a machine part that occurs as a result of conditions that simultaneously produce fretting action and fluctuating loads or strains.
	Fretting wear	The presence of fretting action causes a change in the dimensions of mating parts. The changes in dimensions become large enough to interfere with proper design function or large enough to produce geometrical stress concentrations of such magnitude that failure ensues as a result of excessive local stress levels.
Galling & Seizure (Sliding surfaces)	Galling	Massive surface destruction by welding and tearing, plowing, gouging, significant plastic deformation of surface asperities, and metal transfer between the two surfaces. Occurs when two sliding surfaces are subjected to such a combination of loads, sliding velocities, temperatures, environments, and lubricants that significant impairment to intended sliding surfaces results.
	Seizure	An extension of the galling process that occurs when the two parts are become welded together so that relative motion is no longer possible.

Primary Identifier	Failure Mode	Definition
Impact (Impact load of large magnitude)	Impact deformation	The intolerable elastic or plastic deformation that occurs as a result of impact and causes failure.
	Impact fracture	The magnitudes of the stresses and strains that occur as a result of impact are high enough to cause separation into two or more parts.
	Impact fretting	The fretting action induced by small lateral relative displacements between two surfaces that are not intended to move as they impact together. The small displacements are caused by Poisssan strains or small tangential "glancing" velocity components.
Radiation (Nuclear radiation)	Radiation damage	When the exposure to a nuclear radiation field result in changes in material properties such that the machine part is no longer able to perform its intended function. Radiation exposure usually triggers some other failure mode and is often related to a loss in ductility.
Rupture (Separate into two or more parts)	Brittle fracture	Primary interatomic bonds being broken as a result of elastic deformation and the member, which exhibits brittle behavior, separates into two or more pieces. The fracture exhibits a granular, multifaceted surface.
	Ductile rupture	The plastic deformation in a machine part, which exhibits ductile behavior, to the point of the member separating into two pieces. A dull, fibrous fracture surface results from the propagation of internal voids.
Spalling (Particle spontaneously dislodged from surface)	Spalling	A particle being spontaneously dislodged from the surface of a machine part and prevents the proper function of the member.
Wear (Undesired change in dimension)	Abrasive wear	Occurs when wear particles are removed from the surface by plowing, gouging and cutting action of the asperities of a harder mating surface or by hard particles trapped between the mating surfaces.
	Adhesive wear	A type of wear caused by high local pressure and welding at asperity contact sites followed by motion-induced plastic deformation and rupture of asperity junctions. The result of this form of wear is metal removal or metal transfer.
	Corrosive wear	Occurs when adhesive wear or abrasive wear are combined with conditions that lead to corrosion.
	Deformation wear	A form of wear caused by repeated plastic deformation at the wearing surfaces. A matrix of cracks are produced that grow and coalesce to form wear particles.
	Impact wear	A form of wear caused by repeated elastic deformation at the wearing surface.
	Surface fatigue wear	An occurrence of wear associated with curved surfaces in rolling or sliding contact. Subsurface cyclic shear stresses produce microcracks that propagate to the surface and cause macroscopic particles to be removed by spalling thereby forming wear pits.

Appendix C: Sample Portions of Submitted Case Studies

Ray Rolla Post

Frozen Man on 63

Featuring [illegible], and [illegible]

After yesterday's record breaking snow storm, a man was found frozen to death inside of a vehicle in the middle of Highway 63. He was discovered inside of his red Corvette by two city workers while they were finally clearing the street of the 6 feet of snow from the disastrous great blizzard. Why was the man stuck in the middle of Highway 63 and why frozen in his car? After thorough investigation, police have found striking evidence which might place the blame on failure components from his vehicle.

Police found three different components of failure from the man's Corvette. First was a cracked socket from a socket wrench used to remove lug nuts from wheels, to replace tires. The next component was a broken steering mechanism found after thorough investigation of the cars inner parts. The third failure component was a copper water line with a medium-sized crack at one end of it.

After analyzing clues, the failure components, and the conditions given, the police were able to put together the events of the night that led to the man's unfortunate death.

It was found that earlier during the night of the blizzard, the man lost control while driving. While trying to correct slippage, the wheel was turned abruptly causing the steering component to stress rupture due to the low temperature, high stress of the turn, and abrupt wheel correction.

With his loss of steering, the man thought that a tire was flat and he was forced to step outside and attempt to change it. While using a socket wrench to remove his front tire, the socket cracked. The cause of the crack was thought to be from weakness to the metal after having crevice corrosion in one of the socket's corners.

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The Rolla Holla Express

IDE 120 LAB 3A GROUP 4

SPECIAL POINTS OF INTEREST:

- Tornado Ilene hit in the East Saint Louis area
- 6 Rolla Children Killed in Tornado Ilene incident
- Distraught parents had many people continue to party for them
- Tornado Ilene one of the smallest tornado to date in history.

INSIDE THIS ISSUE:

TORNADO DISASTER KILLS LOCAL CHILDREN

The unfortunate events during Mardi Gras weekend devastated many Rolla people today. During the Mardi Gras celebration in Soulard Market place in Downtown, MO. There was a small F-1 tornado called Tornado Ilene that struck. This tornado hit one of the helicopters that was capturing footage of the parade below.

The helicopter had impact fatigue which hurt the propeller and caused a chain reaction of deadly events. The helicopter hit a swing set of a playground near the parade, where a group of Rolla children dressed as the cast of jersey shore were playing.

The swing set collapsed due to corrosion on the swing bolts from chemicals from the helicopter engine, and it fell on the jersey shore children. To the rescue was a group of adult males dressed as the cast of Sesame Street. The count Dracula called the ambulance, while

Group of Jersey shore children

Ernie tried to cheer up the children by singing the Rubber Ducky song with his Ducky bead necklace. Unfortunately Big Bird who happened to be studying medicine checked their pulses and pronounced them dead at 1:50 PM.

The children's parents were all devastated at the accident. Especially considering that this tornado was on the other side of the river and did not hit the Soulard area.

The parents left the festivities of the parade, and gave away their beads to the best characters that they could find. Captain Jack Sparrow got batman Bacardi Mardi Gras beads for doing a dance to attempt to cheer up the saddened group.

The cast of Jersey Shore has decided to go to the funeral to commerate the children that dressed as them for such a fun event, they were at the Mardi Gras celebration in New Orleans.

TRAFFIC JAM IN ILLINOIS

F-1 Tornado Ilene created several traffic jams on the other side of the river as Mardi Gras celebrators attempted to go back to their homes.

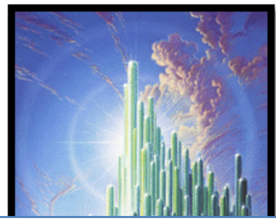
Due to Tornado Ilene hitting a portion of one of the highway signs, an entire section of the highway was shut down. The highway sign was found to have a rupture failure. This discovery was made by one of the best professors at Missouri University of Science and Technology, Dr. Jeffrey Thomas.

No one was killed by this incident but several intoxicated people were on the side of the road vomiting due to lack of nearby rest stops.

The Bad Breakup

Once upon a time in the Land of Oz, there was a princess named Natalie. Her evil arch enemy Paul hates her because he is socially awkward, while she is the most beloved in all the land. Paul is a scrawny and lanky, but his most repugnant feature is the grotesque mole on his left cheek. He was envious of Natalie's wondrous beauty.

Among Natalie's many amazing talents, she had a passion for drumming. One Thursday afternoon Natalie was composing a new musical masterpiece in the highest tower of her magnificent palace. Paul had recently grown more jealous and devised a plan to capture the princess and hide her away so no one



"A Bad Day in the Life of John McEnroe"

"You cannot be serious!" These were the famous last words uttered by John McEnroe as he was surrounded by officers of the Malibu, CA police department. It was the appropriate ending to a day that had started out bad and progressively gotten worse for the former tennis great-turned racquetball player. After a restless night's sleep and a sub-par breakfast, John had headed down to the Malibu YMCA for his daily racquetball game to turn the morning around. While he was stretching, however, John's mood went from grouchy to agitated after he spotted his old tennis nemesis, Jimmy Connors,