Visited 05/12/2016

Comments and Information Responsive to the ANPR for Table Saw Blade Contact Injuries By SawStop, LLC

U.S. Consumer Product Safety Commission

Docket No. CPSC-2011-0074

SawStop, LLC
Stephen F. Gass, Ph.D., President
9564 S.W. Tualatin Road
Tualatin, Oregon 97062
(503) 570-3200

March 16, 2012

Visited 05/12/2016

Introduction and Summary

The U.S. Consumer Product Safety Commission published an Advance Notice of Proposed Rulemaking (ANPR) on October 11, 2011 requesting written comments on injuries resulting from human contact with spinning table saw blades. The ANPR included twenty-five specific requests for information. This document responds to a number of those requests. Significant points discussed in this document include:

- About 1 out of every 100 table saws will be involved in a consumer accident each year with an average cost of about $35,000.
- 85% of table saws involved in consumer accidents are bench table saws.
- The median age of table saws in consumer accidents is 5.7 years.
- 14% of table saws in consumer accidents are one year old or newer.
- Hands contact blades at speeds where existing and proven active injury mitigation technology effectively mitigates injury. Typical approach speeds are on the order of 3.6 inches per second in a direction radially inward toward the axis of the blade, and fast approach speeds are on the order of 14.5 inches per second radially inward.
- Riving knives and blade guards are insufficient to prevent a substantial number of blade contact accidents.
- A blade guard, riving knife or splitter reduces the chance of kickback by roughly 60% but does not eliminate the risk of kickback.
- The manufacturing cost of additional components needed to implement an active injury mitigation system is on the order of $55 to $75.

Visited 05/12/2016

Requests and Responses

Request:

1. Written comments with respect to the risk of injury identified by the Commission, the regulatory alternatives being considered, and other possible alternatives for addressing the risk.

Response:

The risk of injury to consumers from contact with spinning table saw blades is significant. In fact, about 1 out of every 100 table saws used by consumers will be involved in blade contact accidents every year. That accident rate is calculated from injury data collected by the Commission and from table saw data submitted by the Power Tool Institute, Inc. (PTI).[1]

The Commission estimates approximately 67,300 medically treated blade contact injuries occurred on consumer table saws during each of the years 2007 and 2008,[2] and

[1] The PTI is a trade association of predominantly foreign power tool manufacturers. PTI members include: Hilti, Inc. from Liechtenstein, Hitachi Koki, USA, Ltd. from Japan, Makita U.S.A., Inc. from Japan, Metabo Corporation from Germany, Robert Bosch Tool Corporation from Germany, Stanley Black & Decker Corporation from USA, Techtronic Industries Co., Ltd. from Hong Kong, and Delta Power Equipment Corporation from Taiwan. Other PTI members are subsidiaries of, or controlled by, these companies. Specifically, Bosch Power Tools, Dremel, Rotozip Power Tools and Skil Power Tools are listed as PTI members but are controlled by Robert Bosch Tool Corporation from Germany. Milwaukee Electric Tool Corporation and Ryobi Technologies, Inc. are listed as PTI members but are controlled by Techtronic Industries from Hong Kong. DeWalt is listed as a PTI member but is controlled by Stanley Black & Decker.

[2] *ANPR*, Fed. Reg., Vol. 76, No. 196, Tuesday, October 11, 2011, page 62681, bottom of middle column.

the PTI estimates there were 9.5 million table saws in use during each of those years.[3] Dividing 67,300 injuries by 9.5 million saws results in an accident rate of 0.7%. That rate, however, is not an accurate rate for consumers because the injuries reported by the Commission are to consumers only and do not include work-related injuries,[4] while the estimated 9.5 million table saws in use include table saws used by both consumers and workers.[5] Accordingly, the actual number of table saws in use by consumers will be less than 9.5 million, and therefore, the consumer accident rate will be higher than 0.7%. For example, if 75% of the 9.5 million saws were used by consumers, the consumer accident rate would be 0.9%. While a precise consumer accident rate cannot be calculated using the PTI's estimate of 9.5 million table saws in use, the PTI's data nonetheless suggests that approximately 1 in 100 table saws will be involved in non-workplace, blade contact accidents every year.

The accident rate on table saws used by consumers can also be calculated from data collected by SawStop. In 2004 SawStop began shipping saws equipped with active injury mitigation technology and since then has shipped over 32,000 saws.[6]

---

[3] *ANPR*, page 62680, top of right column.

[4] *Briefing Package, Recommended Advance Notice of Proposed Rulemaking for Performance Requirements to Address Table Saw Blade Contact Injuries*, U.S. Consumer Product Safety Commission, September 14, 2011, pages 12-13.

[5] The PTI estimate includes bench saws, contractor saws and cabinet saws, all of which are often used by workers in the workplace.

[6] Active injury mitigation technology refers to technology that detects a dangerous condition between a person and a dangerous portion of a machine, and then performs some action to mitigate any potential injury from the dangerous condition. For example, a woodworking machine might detect contact or proximity between a person and a spinning blade, and then stop, retract, cover or otherwise disable the blade to mitigate

Visited 05/12/2016

In March 2005, several months after SawStop first started shipping saws, SawStop received word that a worker at a cabinet shop in Arkansas had accidentally contacted the spinning blade on a SawStop table saw and the saw stopped the blade instantly, leaving the person with only a scratch on his finger. After that, SawStop began receiving regular reports of "finger saves." As more and more finger saves were reported, SawStop started compiling a spreadsheet summarizing the reports. As of October, 2011, that spreadsheet included 1,316 reports.[7] Out of those 1,316 reports, 196 come from individual consumers.[8] Additionally, based on when saws were first shipped, as of October 2011 SawStop saws used by individual consumers account for 20,900 years of saw usage.[9] Dividing 196 consumer accidents by 20,900 years of saw usage results in an accident rate of 0.9%,[10] or about 1 out of 100.[11]

---

injury. Implementations of active injury mitigation technology may be referred to as active injury mitigation systems.

[7] CD-ROMs with copies of the spreadsheet and the finger save reports are being supplied to the Commission as Appendix 1.

[8] Most of the reports describe accidents occurring at a workplace or school because most SawStop saws are sold to professionals, schools and government entities.

[9] SawStop calculates the 20,900 years of saw usage from the number of SawStop saws sold to individual consumers and from the month those saws were shipped. SawStop knows the number of saws sold to individual consumers from customer registrations. SawStop saws sold to consumers, schools, businesses and government entities total over 83,000 years of saw usage.

[10] The 0.9% accident rate does not account for the fact that SawStop saws are bigger, more capable, and more expensive than the average consumer saw, and therefore, likely to be purchased by customers who use saws more frequently. Increased usage would result in more accidents, and therefore, the 0.9% accident rate might be higher than the rate on the average, less-used consumer saws. Additionally, the 196 accidents on SawStop saws might include situations where the person would not have been injured even if the accident had occurred on some other saw. For example, someone might have touched the side of the blade or touched the blade just before it coasted to a

Visited 05/12/2016

To address blade contact injuries, the Commission is considering three regulatory alternatives: a voluntary performance standard, a mandatory performance standard, and a labeling rule. Of these three alternatives, a mandatory performance standard would be most effective because it would, by definition, mandate performance and therefore eliminate or reduce the risk of serious injuries.

A voluntary performance standard, on the other hand, would be effective only if adopted, and then, only if manufacturers comply with the voluntary standard. The likelihood of a voluntary standard being adopted seems small because any such voluntary standard would have to be approved by the same table saw manufacturers that oppose active injury mitigation technology. Voluntary standards for table saws are approved by a committee sponsored by Underwriters Laboratories, called Standards Technical Panel 745, and that committee is subject to voting and procedural requirements established by the American National Standards Institute or ANSI. According to those requirements, half of the members of that panel must vote and two-thirds of those voting must achieve consensus to adopt a new voluntary standard. There are 24 voting members on that panel (although only 13 to 14 members of the panel

---

stop. Excluding any such accidents would lower the accident rate. On the other hand, SawStop likely does not learn of every accident occurring on its saws, and more accidents would raise the rate.

[11] The PTI says users of SawStop saws "are nearly five times more likely to contact the SawStop's saw blade as opposed to an operator of a conventional saw." *Facts About Table Saw Safety Standards*," Power Tool Institute, Inc., June 14, 2011, page 1. That allegation is false and appears to be the result of the following errors: the PTI overestimated the accidents on SawStop saws by assuming they all occurred in one year when in fact they occurred over several years, and the PTI simultaneously underestimated the accident rate on their own products by not counting accidents that were medically treated in facilities other than emergency rooms.

actually voted in the last two votes), and of the 24 members, 13 are linked to table saw manufacturers or big-box retailers who oppose active injury mitigation technology.[12] Their opposition to active injury mitigation technology is evident from the following:

- 10 of the 13 members are affiliated with the PTI and the PTI opposes safety standards requiring active injury mitigation technology.[13]
- The PTI says: "table saws are a relatively safe product," and "the accident rate is negligible."[14]
- The PTI developed a new blade guard so they could argue to the Commission that active injury mitigation technology is unnecessary.[15]

---

[12] The 13 members linked to table saw manufacturers or big-box retailers who oppose active injury mitigation technology are: Louis Brickner – Delta/Stanley Black & Decker (former VP Engineering); Qin Chen (Chervon – Chinese OEM); Peter Domeny – Robert Bosch Tool Corp. (former Director of Product Safety); Ted Gogoll – Stanley Black & Decker; Joseph Harding – PTI; Jack Hyde – (expert witness, former Emerson Director of Product Safety); James Montgomery – Ryobi; Richard Otterbein – Stanley Black & Decker (expert witness); David Peot – Ryobi (former Director of Advanced Technologies); Suriya Ramachandra – Colovos (OEM); Stan Rodrigues – Makita; Thomas Siwek – Robert Bosch Tool Corp.; Richard Stavenhagen – Robert Bosch Tool Corp. (former employee).

[13] The ten members linked to the PTI are Joseph Harding and the individuals associated with Black & Decker, Robert Bosch Tool Corp., Ryobi, and Makita. The PTI's opposition to standards requiring active injury mitigation technology is shown by statements on its website, powertoolinstitute.info, and by many documents, including a document titled *Facts About Table Saw Safety Standards* dated June 14, 2011, and a document titled *PTI Facts-At-A-Glance* dated June 2011.

[14] *U.S. Consumer Product Safety Commission Petition CP 03-2, Petition for Performance Standards for Table Saws*, Comment of Power Tool Institute, Inc., 32, 39 (Nov. 5, 2003)

[15] *Osorio v. One World Technologies, Inc.*, 06-CV-10725 (D. Mass. 2010), trial transcript day 4, Feb. 25, 2010, at 101:6-15, testimony of David Peot, former Director of Advanced Technologies for Ryobi: "Q. Was there -- was there discussion in meetings of PTI, at which you were present, at which the suggestion was made at PTI that if we can present to the Consumer Product Safety Commission changes in the guard … we can

- The PTI formed a joint venture in 2002 or 2003 to investigate technology for blade contact injury avoidance, in part so they would not have to adopt active injury mitigation technology.[16] And even though the PTI joint venture successfully developed its own active injury mitigation system and built a prototype saw in 2008 or 2009, no PTI member has offered a saw with active injury mitigation technology to the market.
- PTI member companies joined together so that no single company would adopt flesh detection technology and prove its feasibility, thereby creating potential liability for the other companies.[17]

---

argue to the CPSC that they should not adopt SawStop as a safety standard? Do you recall that discussion at meetings at which you were present, sir? A. Yes, I believe I do."

[16] *Id.* at 111:14 to 112:9: "Q. … The joint venture was created to find an alternative technology so that the industry did not have to use Mr. Gass' technology, correct? A. That's probably one of the reasons, yes. Q. Okay. And if they came up with a technology that didn't use Doctor Gass' technology, they wouldn't have to pay him a royalty fee, correct? A. Yes, that would be a correct statement. Q. All right. And you said it was surprising to you that all these people would -- all these industry members would get together and suggest this? A. Correct. Q. Why was it surprising to you, sir? A. Well, members of the industry -- this is a very competitive industry, and the people who belong to the Power Tool Institute are very fierce competitors. Never before in my 30, 35 years of working with the Power Tool Institute had I ever been exposed to something where they said let's get together and jointly develop something. Q. This was completely unprecedented, wasn't it? A. Yes, it was."

[17] *Id.* at 125:2-18: "Q. Now, isn't it true, sir, that the manufacturers got together and decided that they would take this unprecedented step specifically because they were concerned that if one manufacturer adopted SawStop and the other manufacturers didn't that they would be subject to potential liability for not adopting something that was shown to be feasible because one manufacturer put it out on the market? Wasn't that their concern? A. That was one of those concerns, yes. Q. And that's why, is it not, that they got together and decided that they would work collectively so that they would all put it on the market if and when they wanted to and decided that it was in their interests to do so? Isn't that true, sir? A. Again, that's one of the reasons but wasn't the primary reason. Q. But that was one of the reasons, wasn't it? A. That's correct."

Visited 05/12/2016

- Michael Weiby from Sears (who also is a recent past member of STP 745) testified during a deposition in a product liability lawsuit that saws without active injury mitigation technology are as safe as saws with it.[18]

Even if voluntary standards were adopted, the major table saw manufacturers would still have to comply with those standards in order to address a significant portion of the injuries, and their compliance seems questionable given their current opposition to active injury mitigation technology. Additionally, competition from non-complying manufacturers might force manufacturers who otherwise might comply to not comply. For all these reasons, the likelihood of a voluntary performance standard being adopted, and manufacturers complying with any such standard, seems small.

A labeling rule would not eliminate or reduce the risk of serious injury from blade contact or proximity. Manufacturers already affix many warning labels to table saws and they include numerous warnings in product manuals, but the number of table saw injuries has remained essentially constant. A rule requiring labeling would simply codify existing practice without producing different results.

[18] *Lopez v. Sears*, BC449595 (Cal. Superior Ct., LA County), deposition testimony of Michael Weiby on Sept. 7, 2011, transcript pages 58:13 to 59:5: "Q … Do you – did you feel as the engineering manager that the SawStop was a new feature, a technological improvement, or a modification that would make the 10-inch table saw more safe for its users? A No. Q And why not? A The saws are already safe. They meet the safety standards so they are safe. Q Do you feel that by incorporating the SawStop if they worked in the manner in which you saw on the videotape with an actual hand, that that would make it safer than they are without the SawStop device? A No. Q Why not? A Because they are -- because all saws are safe; and if used properly with proper guarding, they are safe."

Visited 05/12/2016

Request:

2. Any existing standard or portion of a standard that could be issued as a proposed regulation;

Response:

No existing standard addresses human contact with spinning table saw blades. Accordingly, SawStop has drafted a proposed rule that might serve as a basis for a safety standard, and that rule is set forth below. SawStop recognizes that changes to the proposed rule might be desirable or warranted based on further consideration of issues surrounding blade contact accidents and different possible active injury mitigation systems. Nevertheless, SawStop offers the proposed rule as a beginning point from which a final safety standard might be developed.

The proposed rule is written as a performance standard so manufacturers can develop different systems to mitigate table saw blade contact injuries; no specific system or technology is required by the proposed rule. The proposed rule says table saws shall "substantially mitigate injury" from contact or dangerous proximity with the teeth of a spinning saw blade, and the proposed rule includes a test to determine whether a table saw substantially mitigates injury. The test specifies that a finger surrogate shall be cut no deeper than 3 millimeters (about 1/8th of an inch) when moving into contact or dangerous proximity with the teeth of a spinning blade at a speed of 0.3 meters per second (about 1 foot per second) in a direction radially inward toward the axis of the blade. That performance was selected because it is reasonably achievable, as shown by SawStop's active injury mitigation technology, and because it is believed to

Visited 05/12/2016

be the least restrictive performance that would still effectively reduce the severity of the vast majority of table saw injuries.

PROPOSED RULE

PART 1221 – SAFETY STANDARD FOR TABLE SAWS

Subpart A – The Standard
1221.1 Scope, compliance date, and definitions.
1221.2 Requirements for table saws.
Subpart B - Certification
1221.10 Purpose, scope, and application.
1221.11 Compliance date.
1221.12 Definitions.
1221.13 Certification testing.
1221.14 Product labeling.
1221.15 Non-complying table saws prohibited.
Appendix to Part 1221 – Findings Under the Consumer Product Safety Act

Authority: The Consumer Product Safety Improvement Act of 2008, Pub. L. 110-314, § 104, 122 Stat. 3016 (August 14, 2008).

Subpart A – The Standard

§ 1221.1 Scope, compliance date, and definitions.

(a) *Scope.* This part establishes a consumer product safety standard for table saws. This safety standard is reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with table saws, namely, human contact with spinning table saw blades.

(b) *Compliance date.* This safety standard for table saws applies to all table saws manufactured in or imported into the United States on or after January 1, 2014.

(c) *Definitions.* The following definitions shall apply to this subpart:

(1) Table saw means a table saw that is a consumer product as defined in 15 USC 2052(a)(5) and that is designed primarily for cutting wood with a generally planar, circular blade having teeth around its periphery and having a nominal diameter of 12 inches or less, where the table saw includes a table top for supporting a workpiece, and where at least a portion of the blade extends above the table top to cut a workpiece on the table top. Table saws vary in price, size, weight, motors, drive systems, stands, housings, and other features. Common

Visited 05/12/2016

names of various types of table saws include, but are not limited to, bench saws, bench top saws, jobsite saws, contractor saws, hybrid saws and cabinet saws.

(2) *Blade is spinning* includes when the blade is driven by a motor and when the blade is coasting down after power to the motor has been turned off, but excludes when the blade has coasted down to a speed of 60 revolutions per minute or less.

(3) *Any person* means all persons, including an operator or operators of a table saw and bystanders, such as a child in a parent's workshop, a neighbor watching a friend use a table saw, and students in a shop class.

(4) *Teeth of the blade above the table top* means the generally annular portion of the blade above the table top having a radial dimension extending from the bottommost gullet between the teeth to the outermost tip of the teeth.

§ 1221.2 Requirements for table saws.

Every table saw shall, when the blade is spinning, detect contact or dangerous proximity between any person and the teeth of the blade above the table top, and substantially mitigate injury from such contact or dangerous proximity. Notwithstanding the prior sentence, the ability of the saw to detect contact or dangerous proximity, or the ability of the saw to substantially mitigate injury, may be temporarily deactivated by a person so that the saw can cut material which would otherwise be detected as a person.

Subpart B – Certification

§ 1221.10 Purpose, scope, and application.

(a) *Purpose*. Section 14(a) of the Consumer Product Safety Act, 15 U.S.C. 2063(a), requires every manufacturer, importer, and private labeler of a product which is subject to a consumer product safety standard to issue a certificate that the product conforms to the applicable standard, and to base that certificate either on a test of each product or on a reasonable testing program. The purpose of this subpart is to establish requirements that manufacturers, importers, and private labelers of table saws subject to the Safety Standard for Table Saws shall follow in issuing such certificates.

(b) *Scope and application*. The provisions of this subpart apply to all table saws which are subject to the requirements of 16 CFR part 1221.2.

§ 1221.11 Compliance date.

Compliance with this subpart B of the safety standard for table saws shall be required on the date specified in 16 CFR part 1221.1(b).

Visited 05/12/2016

§ 1221.12 Definitions.

The following definitions shall apply to this subpart:

(a) *Table saw* shall have the definition set forth in 16 CFR part 1221.1(c)(1).

(b) *Test surrogate* means an item or assembly capable of being fed into contact with, and of being cut by, a table saw blade, and having one or more characteristics similar to a human so that a table saw detects the one or more characteristics in the item or assembly in substantially the same way the table saw detects the same one or more characteristics in a human.

(c) *Coast down* refers to the period of time when a blade is decelerating after being spun by a motor. Coast down begins when a blade is no longer being driven by the motor and ends when the speed of the blade is 60 revolutions per minute.

(d) *CPSC* or *Commission* means the U.S. Consumer Product Safety Commission.

§ 1221.13 Certification testing.

(a) *Test for compliance with 16 CFR part 1221.2.* Table saws shall meet the following test to comply with 16 CFR part 1221.2:

(1) Any and all blade guards, splitters and riving knives that can be removed from the saw by a user with or without the use of tools shall be removed from the saw, and any and all blade guards, splitters and riving knives that cannot be removed from the saw but can be retracted below the table top shall be retracted below the table top.

(2) The table saw shall be equipped with a blade recommended for use by the manufacturer of the table saw, and the blade saw shall be raised to its maximum operational elevation relative to the table top.

(3) Power shall be provided to the table saw and the table saw shall be turned on to cause the blade to spin at its normal speed.

(4) A test surrogate shall then be moved into contact or proximity with the teeth of the blade at a speed of at least 0.3 meters per second, along the table top, in a line substantially parallel with the center plane of the blade, from a position in front of the blade, generally toward the center of the blade, and shall continue moving as described until the table saw has acted to substantially mitigate injury.

(5) A test surrogate shall then be moved into contact or proximity with the teeth of the blade at a speed of at least 0.3 meters per second, in a line substantially parallel with the center plane of the blade, from a position directly over the highest point of the blade, generally toward the center of the blade, and shall

Visited 05/12/2016

continue moving as described until the table saw has acted to substantially mitigate injury.

(6) A test surrogate shall then be moved into contact or proximity with the teeth of the blade at a speed of at least 0.3 meters per second, in a line substantially parallel with the center plane of the blade, from a position behind the blade, generally toward the center of the blade, and shall continue moving as described until the table saw has acted to substantially mitigate injury.

(7) Step 4 above shall be repeated during coast down.

(8) Test surrogates used in steps 4, 5, 6 and 7 above shall then be visually inspected for a cut, and if there is a cut, the depth of the cut shall be measured and shall not exceed 3 millimeters.

(b) *Supply of surrogates for CPSC testing.* A manufacturer or importer of a table saw shall supply test surrogates to the Commission when requested by the Commission and as necessary for the Commission to test compliance with 16 CFR part 1221.2, and shall also provide to the Commission documentation showing that the provided test surrogates meet the definition set forth in 16 CFR part 1221.12(b).

§ 1221.14 Product labeling.

A label certifying compliance with the requirements of 16 CFR parts 1221.2 shall be permanently and conspicuously affixed to each table saw that is subject to 16 CFR part 1221.2. The label shall clearly and legibly state: "Meets CPSC Safety Standard for Table Saws" and shall clearly and legibly state the month or week and year of manufacture. Such labeling shall be deemed to be a certificate of compliance as required by 15 U.S.C. 2063.

§ 1221.15 Non-complying table saws prohibited.

The sale, offer for sale, manufacture for sale, or distribution in commerce in the United States, or import into the United States, of a table saw on or after the date set forth in 16 CFR part 1221.1(b) that does not comply with the requirements of 16 CFR parts 1221.2 is a prohibited act and a violation of 15 U.S.C. 2068(a) regardless of whether the table saw has been certified to comply with the requirements of 16 CFR parts 1221.2.

Appendix to Part 1221 – Findings Under the Consumer Product Safety Act

The Commission makes the following findings:

[ADD FINDINGS PURSUANT TO 15 USC 2058(f)]

Visited 05/12/2016

Request:

3. A statement of intention to modify or develop a voluntary standard to address the risk of injury discussed in this notice, along with a description of a plan (including a schedule) to do so;

Response:

In the summer of 2011 Underwriters Laboratories formed a working group to develop a voluntary safety standard and SawStop's president, Stephen Gass, is a member of that working group. To date, the working group has not written a proposed voluntary safety standard or started drafting such a standard.

Request:

4. Studies, tests, or surveys that have been performed to analyze table saw blade contact injuries, severity of injuries, and costs associated with the injuries;

Response:

In 2011 the Commission published a document titled "Survey of Injuries Involving Stationary Saws, Table and Bench Saws, 2007-2008" which sets forth data concerning table saw blade contact injuries. [19] SawStop makes the following observations based on that data.

Types of Table Saws Involved in Accidents

The 2007-2008 survey asked whether the saw involved in each accident was "a portable bench saw model, a semi-portable contractor saw model (saw is on a frame with legs), or a fixed cabinet saw model."[20] The responses to that question reported 68.7% of saws involved in accidents were fixed cabinet saws, 18.3% were semi-portable contractor saws, and 10.5% were portable bench saws.[21] That data, however, is inconsistent with other data in the survey. The survey also asked: "Is the blade of the

[19] Sadeq R. Chowdhury, Ph.D., Caroleene Paul, *Survey of Injuries Involving Stationary Saws, Table and Bench Saws, 2007-2008*, U.S. Consumer Product Safety Commission (March 2011) [hereinafter "2007-2008 survey"].

[20] Question 99 in the 2007-2008 survey. This question is ambiguous because the names of different types of table saws are used inconsistently among consumers and manufacturers. For instance, bench saws may be called contractors saws because they are used by contractors, and because many bench saws are mounted on frames with legs. Bench or contractor saws may be called cabinet saws because they typically include housings that can be called cabinets, and because they can be used in workshops where they are fixed in position rather than portable.

[21] 2007-2008 survey, table 4.7, page 22.

Visited 05/12/2016

saw direct drive (blade mounted directly onto the motor output shaft) or indirect drive (belt or gear driven)?"[22] Respondents said 59.2% were direct drive and 33% were indirect drive, which contradicts the responses identifying the type of saw because all cabinet saws are belt-driven; they are not direct drive saws. In other words, the majority of table saws involved in accidents cannot be both cabinet saws and direct drive saws. This inconsistency forces the conclusion that one or both of the questions must have been misunderstood by many respondents, and as a result, the reported percentages do not accurately reflect the types of saws involved in accidents.

Nevertheless, the type of table saws involved in accidents can be determined with reasonable accuracy from the survey data because the survey also asked for the trade or brand name and model number of saws involved in accidents – which is not ambiguous or subject to interpretation and not likely to be mistaken by a consumer responding to the survey. The Commission's report does not identify brand names and model numbers, and that information is redacted from most of the survey responses available for public review. However, 51 of the responses reviewed by SawStop disclose brand names or model numbers. The brand names identified in those 51 responses are summarized in Table 1.

[22] Question 28 in the 2007-2008 survey. That question is confusing because no table saw currently on the market mounts a blade directly onto a motor output shaft. Instead, in direct drive saws the motor output shaft spins gears and those gears spin an arbor which supports the blade. The gears and arbor are typically within the motor housing so the arbor appears to be directly driven by the motor, but it is not.

Visited 05/12/2016

Brand Name	Number of Responses	Brand Name	Number of Responses
Ryobi	19	Powermatic	2
Craftsman	7	Makita	1
Skil	4	Robland	1
Hitachi	3	Task Force	1
Delta	3	DeWalt	1
Ridgid	3	Harbor Freight	1
Bosch	2	Shop Fox	1
Jet	2		

Table 1

The only type of table saw sold under each of the Ryobi, Skil, Bosch, Makita and Task Force brands is a bench table saw; there are no contractor or cabinet saws sold under those brands.[23] Craftsman, Hitachi, Delta, Ridgid, Jet, DeWalt and Harbor Freight sell bench table saws as well as contractor and/or cabinet saws, but many of the responses identifying those brands further specified the model number of the saw involved in the accident or the model number of an accessory on the saw involved in the accident, and the types of saws can be determined from those model numbers. The responses identifying Powermatic, Robland and Shop Fox all specified the model numbers of the saws involved and therefore the types of saws can be determined.

[23] Techtronic Industries Co., Ltd. from Hong Kong ("TTI") owns the Ryobi brand and sells bench table saws under that brand. TTI also sells contractor saws, but under the Ridgid brand only; TTI does not sell contractor saws under the Ryobi brand. The comments to the ANPR filed by George Carpinello of Boies, Schiller & Flexner LLP, however, include a table of product liability lawsuits and four of those lawsuits are said to involve contractor saws manufactured by Ryobi. The four lawsuits are those naming Robert Bell, Carl Leis, Philip Orchowski, and Adam Thull as plaintiffs. The name Ryobi in the table for those four lawsuits, however, refers to the manufacturer TTI, not to the brand of saw. This is evident from the fact that the table also says the saw involved in the Bell lawsuit is a "Ridgid TS-3650," the saw involved in the Leis lawsuit is a "TS-3100-a" which is a Ridgid brand model, the saw involved in the Orchowski lawsuit is a "TS-3650" which is another Ridgid brand model, and the saw involved in the Thull lawsuit is a "Ridgid TS 3660."

Visited 05/12/2016

Based on the brand and model numbers of saws involved in the accidents, 35 of 51 saws were definitively bench table saws (68.6%), 6 were definitively cabinet or contractor saws (11.8%), and 10 were unknown (19.6%). Allocating the unknown saws proportionally to the other categories (or excluding them from the calculation), shows that 85% of table saws involved in consumer accidents are bench table saws. This is summarized in Table 2.

Types of Table Saws Involved in Accidents			
	Number	% Without Allocating Unknown Saws	% Allocating Unknown Saws
Bench table saws	35	68.6%	85.4%
Cabinet or contractor	6	11.8%	14.6%
Unknown	10	19.6%	n/a

Table 2

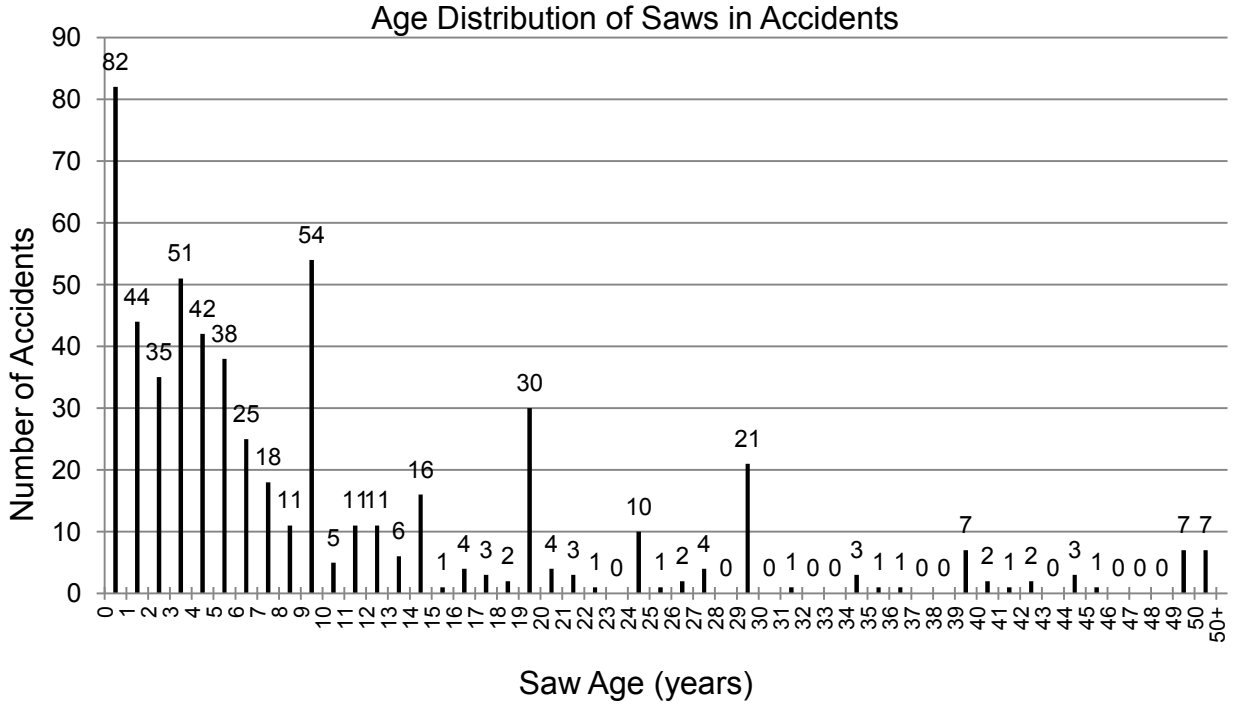
Interestingly, one of the survey responses reviewed by SawStop identifies Bosch as the brand of the saw and says the saw is a fixed cabinet saw (survey case number 080211HEP9007). Another response identifies Ryobi as the brand and says the saw is a fixed cabinet saw (survey case number 080305HEP9003). However, there are no fixed cabinet saws sold under the Bosch or Ryobi brands. Still another response identifies the saw as a semi-portable contractor saw with model number 137.24884, but that model is a Craftsman bench saw, not a contractor saw (survey case number 080429HEP8722). These responses demonstrate why the types of saws involved in accidents cannot be reliably determined from the survey question asking for the type of saw.

Visited 05/12/2016

Median Age of Table Saws Involved in Accidents

As part of the 2007-2008 survey, Commission staff interviewed people involved in table saw accidents and asked for the date of the accident, when the saw was purchased, and the age of the saw.[24] Based on 571 responses to those questions, the median age of table saws involved in consumer accidents is 5.7 years.[25] Also, 14% of accidents (82 out of 571) occurred on table saws one year old or newer. The age distribution of saws involved in those 571 accidents is shown in Figure 1.

Figure 1



[24] The accident date is reported in a table on the first page of each survey response in cell number 4. Survey question 139 asks when the saw was purchased, and survey question 141 asks for the age of the saw.

[25] For this calculation, the date of purchase was assumed to be mid-year for survey responses specifying only the year of purchase. The date of purchase was assumed to be midway between the date of accident and the beginning of the year for survey responses specifying only the year of purchase and specifying that the accident occurred the same year as the year of purchase.

Visited 05/12/2016

The age of saws involved in accidents is relevant in understanding when benefits from new safety standards would be realized. The Commission estimates approximately 67,300 table saw blade contact accidents each year at a cost of $35,000 per accident.[26] Since 14% of consumer accidents involve saws one year old or newer, those accidents would be mitigated within the first year after a new standard becomes effective. And 50% would be mitigated within six years because the median age of saws involved in consumer accidents is 5.7 years. Accordingly, in the first year alone, the societal cost of accidents would be reduced by approximately $326 million, and those costs would be reduced by approximately $1 billion annually within six years.[27] Those savings greatly outweigh the projected costs of implementing active injury mitigation technology in table saws. The PTI estimates the cost to implement active injury mitigation technology in table saws to be $2 to $10 million per company, depending on the number of table saw models each company would redesign.[28]

---

[26] *ANPR*, page 62681, bottom of middle column to top of right column.

[27] First year savings are calculated as follows: 67,300 accidents x 14% mitigation x $35,000 per accident x 99% effectiveness = $326 million. Savings over six years are calculated as follows: 67,300 accidents x 50% mitigation x $35,000 per accident x 99% effectiveness = $ 1.1 billion. An effectiveness of 99% is used because SawStop saws equipped with active injury mitigation technology have proven to be 99% effective in reducing injury costs, as explained below in response to request number 6.

[28] "Our members estimate that just the cost of redesign, retooling, testing, and regulatory approvals will be between two and ten million dollars per company, based on the number of models each company will have to redesign." *U.S. Consumer Product Safety Commission Petition CP 03-2, Petition for Performance Standards for Table Saws, Comment of Power Tool Institute, Inc.*, 34 (Nov. 5, 2003).

Visited 05/12/2016

Request:

5. Studies, tests, or surveys that analyze table saw use in relation to approach/feed rates, kickback, and blade guard use and effectiveness;

Response:

SawStop has compiled data relating to table saw blade contact accidents occurring on SawStop saws, as explained above in response to request number 1. The data originates from people reporting accidents. Specifically, persons who have blade contact accidents on SawStop saws are encouraged to complete and submit to SawStop a form called a “Finger Save Recount” describing the accident and any resulting injury. Additionally, a component in SawStop saws called a “brake cartridge” records data about the saw whenever the saw detects contact and acts to mitigate injury. For example, the brake cartridge stores an electrical signature of the contact with the blade, as well as information about the saw, such as how fast the blade was spinning at the time of the accident. The brake cartridge can be removed from the saw by a user, and persons who have blade contact accidents are encouraged to return their brake cartridges to SawStop so that SawStop can download the stored data. SawStop encourages users to return used brake cartridges by offering a free replacement brake cartridge for each returned cartridge that shows data consistent with human contact with the spinning blade. SawStop has compiled all this data in a spreadsheet and an analysis of that spreadsheet reveals the following information about approach/feed rates, kickback, and blade guard use and effectiveness.

Visited 05/12/2016

Approach/Feed Rates

SawStop's data shows that in blade contact accidents hands approach the blade at speeds where active injury mitigation technology effectively mitigates injury. In 1,316 reported accidents, many of which involved kickback, there have been no reports of a table saw amputating a finger. Therefore, at whatever speeds the fingers and hands were moving in those accidents, those speeds were within a range where active injury mitigation technology is effective. This bears repeating – out of 1,316 table saw accidents, not one involved a hand moving at a speed that would render active injury mitigation technology ineffective.[29]

SawStop's data can also be used to quantify a typical approach speed of a human hand involved in a blade contact accident. Every SawStop saw includes an electronic detection system that detects when a person contacts the blade. The system induces an electrical signal on the blade and monitors that signal for changes. The changes occur when a human touches the blade because a human body is conductive and has capacitance. Figure 2 is a graph of the signal voltage on the blade, and it shows the changes in the electrical signal when a human finger touched the spinning blade in an actual accident. The dips in the line illustrate the changes in the signal detected as successive teeth touched the finger.

[29] The PTI claims that "[t]esting of SawStop shows large variability in performance," and the PTI presented "test data" to the Commission purportedly showing that SawStop saws often do not mitigate serious injury in simulated kickback accidents. *Consumer Product Safety Commission Table Saw Safety Update*, Power Tool Institute, Inc., November 2, 2009, slides 25, 26 and 27, documents BOSCH 018223, BOSCH 018224, BOSCH 018225. The PTI's claims, however, are directly refuted by SawStop's real-world accident data which shows that active injury mitigation technology has consistently mitigated injuries in accidents involving kickback.

Visited 05/12/2016

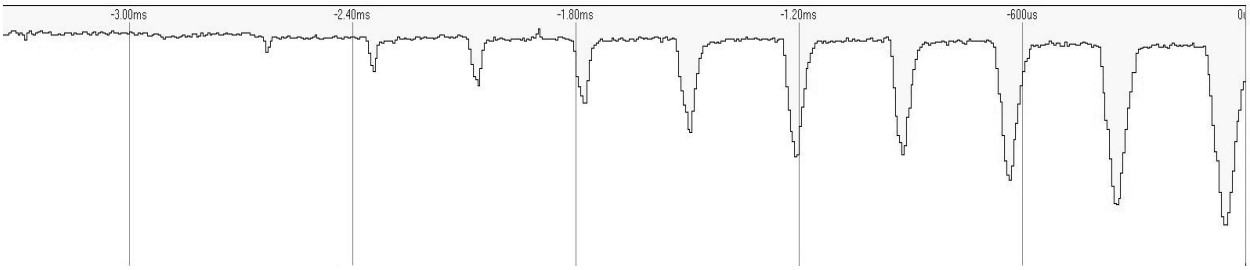


Figure 2

The width and depth of each dip depends on how deep each tooth cuts into the finger. As the teeth cut deeper and deeper, each tooth contacts the finger longer and longer, resulting in wider dips. Also, deeper cuts result in better electrical connections which allow the body to absorb more and more of the signal on the blade, resulting in bigger and bigger drops. As shown at the left of the figure, the signal is generally flat until the person begins to contact the blade. Initially, the teeth simply graze the skin and therefore the dips are narrow and shallow, as shown by the first few dips in the signal, moving left to right in the figure. Gullets between the teeth allow the signal to rise back to a normal level after each tooth moves past the finger, but the signal dips again when each subsequent tooth contacts the finger. As the finger moves further into the blade, the teeth cut deeper and the dips get progressively bigger until they achieve a depth sufficient to activate the brake cartridge to stop the blade and mitigate injury. In Figure 2, activation of the brake cartridge occurred at the right-most edge of the graph, labeled at time 0, and the finger was in contact with the blade for about 2.6 milliseconds before the teeth cut deep enough to activate the brake cartridge.

The number of teeth that contact a person prior to activation of the brake cartridge depends on the approach speed of the finger to the blade. With a fast moving hand, only one or a few teeth will cut into the finger before the cut is sufficiently deep to

activate the brake cartridge. With a slow moving hand, many teeth might graze the finger before the teeth cut deep enough to trigger the brake cartridge.

Data such as illustrated in Figure 2 may be thought of as an electrical signature of finger contact. The brake cartridges in SawStop saws store this data similarly to the way a “black box” in an airplane stores data in the event of an airplane crash.

By analyzing a stored electrical signature, one can measure the time between the blade first grazing the person’s skin and the blade cutting deeply enough to activate the brake cartridge. Typically, the dips in the signal are sufficient to activate the brake cartridge at least by the time the teeth cut through the epidermis or outer layer of skin because the flesh under the epidermis is more conductive. The mean epidermal thickness on human fingertips is reported to be 0.369 millimeters.[30] Accordingly, dividing that thickness by the typical time between first contact and brake cartridge activation will result in an estimate of the typical approach speed of fingers to blades.

Table 3 shows the times between contact and activation reported in SawStop’s data, as well as the number of accidents reported for each time.

[30] Whitton, Judi T., and Everall, J.D., *The thickness of the epidermis*, British Journal of Dermatology, (1973), 89, at page 470. Whitton and Everall report the mean epidermal thickness on the side of the finger to be 0.2227 millimeters, and on the back of the finger to be 0.1381 millimeters. The thickness of the epidermis on fingertips seems most relevant here because table saw accidents typically involve contact between the fingertip and blade.

Visited 05/12/2016

Contact to Activation Time - All Accidents (ms)	Number of Accidents
0 < 0.1	17
0.1 < 0.25	8
0.25 < 0.5	18
0.5 < 1	173
1 < 2	147
2 < 4	256
4 < 8	210
8 < 16	154
16 < 32	74
32 < 64	69
64 < 128	34
>128	4

Table 3

The median time between contact and activation in SawStop's data is 4 milliseconds. A finger traveling 0.369 millimeters in 4 milliseconds means the finger is approaching the blade at an average speed of 9.2 centimeters per second, or 3.6 inches per second. Thus, a typical approach speed of a human hand in a blade contact accident is on the order of 3.6 inches per second. It should be noted that this velocity represents the component of the velocity in a direction radially inward to the axis of the blade and not necessarily the overall speed of the hand.

SawStop's data can also be used to estimate the approach speed of a hand in an accident that resulted in stitches or treatment by a doctor or hospital. SawStop's data includes 62 such accidents showing the time between contact and activation, and Table 4 shows that data.

Visited 05/12/2016

Contact to Activation Time - Accidents Treated by Stitches or a Doctor or Hospital Visit (ms)	Number of Occurrences
0 ≤ 0.1	4
0.2 ≤ 0.4	4
0.5 ≤ 0.6	4
0.7 ≤ 0.8	4
1	17
1.3 ≤ 1.6	5
2 ≤ 2.2	7
2.3 ≤ 2.5	3
3 ≤ 3.6	5
3.9 ≤ 4	3
5 ≤ 5.4	3
≥ 6	3

Table 4

The hands were almost certainly moving faster in these accidents than in a typical accident because the resulting injuries were worse. As stated, SawStop saws typically detect contact and activate the brake cartridge at least by the time the blade cuts through the epidermis. Once activated, the brake stops the blade in about 3 milliseconds. A deeper cut, therefore, means the hand was moving faster than usual because the hand moved further into the blade during those 3 milliseconds.

The most common time between contact and activation for these accidents was 1 millisecond. Assuming a finger travels 0.369 millimeters in that time means the finger approaches the blade at a radial velocity of about 37 centimeters per second, or 14.5 inches per second.

The velocities calculated in this section are approximations that provide perspective to better understand blade contact accidents. Actual velocities in real-world accidents will vary.

Visited 05/12/2016

Kickback

One of the questions on SawStop's "Finger Save Recount" form asks whether the accident involved kickback. Of those answering that question, 14.3% said kickback was involved in their accident (172 out of 1,201). This is significantly less than the 35.6% observed in the Commission's study of saw-related injuries occurring in 2007 and 2008. SawStop's smaller percentage is likely due to SawStop saws having riving knives and improved blade guards, SawStop saws being more precisely aligned, and SawStop saws having larger work surfaces to provide better stability of the workpiece than the more common, small, bench table saws.

Riving Knife and Blade Guard Usage and Effectiveness

SawStop "Finger Save Recount" forms also ask whether the person involved in the accident was using a blade guard, riving knife or splitter at the time of the accident. Of those answering that question, 45.5% were using a riving knife or splitter (486 out of 1,067) and 24.2% were using a blade guard (258 out of 1,067). For comparison, the Commission's 2007-2008 survey reports blade guard usage at 30.9%. SawStop's data and the Commission's data both show that substantial numbers of accidents occur even when a riving knife or blade guard is in use. In other words, riving knives and blade guards are insufficient to prevent a substantial number of blade contact accidents.

SawStop's data also shows that accidents involving kickback occur in significant numbers even when a riving knife or blade guard is in use. Of those using a riving knife or splitter at the time of their accident who specified whether kickback was involved, 10.4% said kickback was involved (50 out of 482). The corresponding percentage for those using a blade guard was similar at 8.2% (21 out of 255). This indicates that the riving knife and blade guard are similar in effectiveness at reducing kickback. On the

Visited 05/12/2016

other hand, for those not using the blade guard, riving knife or splitter, and specifying whether kickback was involved, the percentage of accidents involving kickback was 24.5% (78 out of 319), which is over two times greater than when one of those devices was used. Thus, the data shows that a blade guard, riving knife or splitter reduces the chance of kickback by roughly 60%, but does not completely eliminate the risk of kickback.

Additional data concerning blade guard usage comes from surveys conducted by PTI member companies and reported to the Commission at a meeting on November 2, 2009.[31] Those companies designed a new blade guard and surveyed users to see if they were using the new style blade guard more than old style blade guards. The results of the surveys show that while some consumers use the new style blade guard more, many consumers still do not use a blade guard at all. The results are summarized in Table 5.[32]

[31] *Consumer Product Safety Commission Table Saw Safety Update*, Power Tool Institute, Inc., November 2, 2009, slides 16, 19 and 22, documents BOSCH 018214, BOSCH 018217, BOSCH 018220.

[32] The percentages listed in Table 5 for Ryobi and Bosch are for “do-it-yourself” or DIY users. A DIY user is someone who is not a professional woodworker or someone who does not use a table saw commercially. The percentages listed for Black & Decker are for all respondents because Black & Decker did not report separate percentages for DIY users, although Black & Decker said 43% of its respondents considered themselves DIY users.

Visited 05/12/2016

	Usage of Old Style Blade Guards			Usage of New Style Blade Guards		
	Ryobi	Bosch	Black & Decker	Ryobi	Bosch	Black & Decker
Never use guard	52%	42%	50%	20%	18%	39%
Use guard sometimes	18%	28%	25%	14%	18%	15%
Use guard frequently or most of the time	7%	10%	18%	23%	24%	20%
Always use guard	21%	18%	6%	43%	40%	26%

Table 5

The data concerning old style blade guards is interesting because it measures blade guard usage by consumers during 2007 and 2008, the years involved in the Commission's survey of consumer table saw blade contact accidents. Although some table saws with new style guards began shipping in 2007, it would have been a relatively small number. The vast majority of blade guards used during 2007 and 2008 would have been old style blade guards. Thus, according to the surveys by Ryobi, Bosch and Black & Decker, in 2007 and 2008, between 24% and 28% of consumers were using blade guards always or frequently (i.e., Ryobi: 21% always + 7% frequently; Bosch: 18% always + 10% frequently; Black & Decker: 6% always + 18% frequently).

The Commission's survey of consumer table saw blade contact injuries in 2007 and 2008, however, reports 30.9% of accident victims were using blade guards at the time of their accident – 3% to 7% higher than in the PTI survey. The higher rate of blade guard usage among accident victims suggests the somewhat surprising conclusion that the accident rate when using a blade guard is higher than the accident rate when not using a blade guard. In other words, because the percentage of blade guard usage in the consumer population at large is less than the percentage of blade guard usage among those experiencing blade contact accidents, the data suggests that blade guards

Visited 05/12/2016

cause more accidents than they prevent.[33] Only if blade guard usage in the consumer population at large was higher than 30.9% would the data suggest that blade guards reduce the number of accidents. Thus, the Commission's data combined with the PTI's data concerning blade guard usage raises significant questions about the effectiveness of blade guards in preventing blade contact accidents.

[33] This conclusion is supported by statements from woodworkers who say they do not use blade guards because they are more dangerous.

Visited 05/12/2016

Request:

6. Studies, tests, or descriptions of new technologies, or new applications of existing technologies that can address blade contact injuries, and estimates of costs associated with incorporation of new technologies or applications;

Response:

The active injury mitigation technology currently implemented in SawStop table saws is one technology that addresses blade contact injuries. SawStop table saws detect contact between a human and the spinning blade, and then stop and retract the blade within milliseconds to mitigate injury. As explained below, SawStop saws have been 99% effective in addressing blade contact injury costs.

Users of SawStop table saws have reported 1,316 blade contact accidents. If the saws involved in those accidents had not been equipped with active injury mitigation technology, the severity of the resulting injuries likely would have been distributed similarly to the injuries observed in the Commission's study of table saw accidents occurring in 2007 and 2008. Specifically, 654 would have resulted in emergency room visits (1,316 x 33,450 / 67,300). Additionally, 12%, or 78 of the 654 emergency room visits, would have involved amputation of one or more fingers. Instead, 25% of the accidents on SawStop saws report no visible injury (324 out of 1,316) and 94.2% of the accidents specifying a treatment reported no treatment beyond a bandage (1,123 out of 1,192). Only 5.8% of the accidents specifying a treatment reported medical treatment

Visited 05/12/2016

(69 out of 1,192).[34] The most serious outcome reported was an elective amputation of the distal phalanx of a left ring finger by a doctor due to damage to the tendon from a relatively shallow cut on the top of the finger directly over the distal-most joint of the finger.

Table 6 lists the treatments reported in SawStop's data.[35]

Reported Treatment	Number of Reports	Percentage
No treatment	560	42.5%
Cleaned	42	3.2%
Bandaid	414	31.5%
Bandage	76	5.8%
Antiseptic	8	0.6%
In-house first aid	23	1.7%
Bandaged at hospital or clinic	14	1.1%
Doctor visit	13	1%
Hospital visit	1	0.1%
Stitches	40	3%
Doctor amputated finger tip	1	0.1%
Not specified	124	9.4%
TOTAL	1,316	

Table 6

Table saw blade contact injuries cost society $2.36 billion every year and the average cost per blade contact accident is about $35,000. Accordingly, if the saws involved in the 1,316 reported accidents on SawStop saws had not been equipped with

[34] "Medical treatment," as used herein, has the same meaning as in the Commission's Injury Cost Model, namely, treatment in an emergency room, a doctor's office, an outpatient clinic, or a similar setting.

[35] The treatments listed in Table 6 are the treatments reported on Finger Save Recount forms. The categories "doctor visit" and "hospital visit" are not treatments, but they are what respondents reported. SawStop does not know what treatments were received as a result of those doctor and hospital visits.

Visited 05/12/2016

active injury mitigation technology, then those accidents would have cost approximately $46 million ($35,000 x 1,316). Instead, assuming the average cost of treatment to be $5,000 for each of the 69 reported instances involving stitches or a doctor or hospital visit, and taking into account that a new brake cartridge (~$70) will be required and a new blade (~$30) likely will be required for each activation of the injury mitigation system on a SawStop saw, the realized costs of the 1,316 accidents total around $500,000.[36] Thus, the active injury mitigation technology on the SawStop saws saved approximately $45.5 million in costs. In other words, SawStop saws have proven 99% effective in mitigating the costs of table saw injuries ($45.5M / $46M).

SawStop's active injury mitigation technology has even been effective in accidents involving kickback. As explained in response to request number 5, kickback was involved in 14.3% of accidents (172 out of 1,201). And of those accidents, 82.5% were treated with nothing more than a bandage (142 out of 172). Only 7% reported receiving stitches (12 out of 172). There were no amputations.

[36] The $500,000 is calculated as follows: (69 x $5,000) + (1,316 x ($70 + $30)) = $476,600.

Visited 05/12/2016

Request:

7. Estimated manufacturing cost, per table saw, of new technologies or applications that can address blade contact injuries;

Response:

The active injury mitigation technology incorporated in SawStop saws requires additional components compared to table saws without active injury mitigation technology. The costs of all the additional components total $58.68, based on manufacturing approximately 5,000 saws per year. The additional components and their current manufacturing costs are set forth in Table 7.

Component	Cost
Brake Cartridge	$23.90
Cartridge Key	$1.29
Cartridge Cable	$5.73
Cartridge Bracket	$1.50
Insulation on Arbor	$2.00
Electrode Shell Assembly	$5.26
Power Supply / Motor Control	$19.00
TOTAL	$58.68

Table 7

The components listed in Table 7 are applicable for all table saws, including bench table saws, contractor saws and cabinet saws. The costs for the listed components would decrease significantly if the technology were adopted more widely because of economies of scale and design optimization.

Several PTI members joined together to develop an active injury mitigation system to address blade contact injuries, and those members have built a prototype table saw incorporating their system. The PTI prototype was described during a trial in Boston in 2010.[37] During that trial, Peter Domeny, who is a past Director of Product Safety for Robert Bosch Tool Corporation, showed a video of the prototype and testified that the active injury mitigation technology in the prototype added $55 to the cost of the saw.[38]

Black & Decker estimated $74 as the cost to add active injury mitigation technology to portable jobsite saws, which Black & Decker broke down as follows: "Cartridge: $5-$10, Electronics: $37, Mechanical: $27, Total: $74." This information comes from an internal Black & Decker spreadsheet made public in a product liability lawsuit.[39]

---

[37] *Osorio v. One World Technologies, Inc.*, 06-CV-10725 (D. Mass. 2010). The PTI also showed a video of their prototype to Commissioners during meetings on June 14, 2011. See, e.g., *Log of Meeting* attended by Commissioner Robert Adler, June 14, 2011.

[38] *Id.*, trial transcript day 6, March 1, 2010 at 161:4-13: "Q. But the joint venture has come up with its own estimate? Hasn't the joint venture estimated that the cost of putting flesh-detection technology on a transportable, bench-top, belt-driven saw is $55; has it not, sir? A. Absolutely, because it's totally different design. I have testified to the jury that we are not using a $69 cartridge. We are using, at most, $15 pyrotechnic projection. You are not using a -- you're not damaging the blade. Altogether it's different -- it's altogether different system. So you cannot compare the SawStop cost to the JV cost."

[39] *Ptak v. Black & Decker*, 1:08-CV-06212 (N.D. Ill.). The spreadsheet is available through the pacer.gov website (pacer is the acronym for Public Access to Court Electronic Records). The document is found at number 107-7 on the court's docket for the case. The quote is from row 18, column D on the spreadsheet. A copy of the spreadsheet is being submitted as Appendix 2.

Visited 05/12/2016

Request:

8. Expected impact of technologies that can address blade contact injuries on wholesale and retail prices of table saws;

Response:

The impact on wholesale and retail prices of table saws due to active injury mitigation technology cannot be determined simply by comparing current retail prices of table saws with and without such technology. For example, the SawStop Model PCS31230-TGP252 with 52" rails and fence includes active injury mitigation technology and is comparable in size, function and quality to a Delta 36-L352 Unisaw with 52" rails and fence without such technology, but both saws sell for approximately the same price.[40]

Moreover, increasing manufacturing costs do not necessarily cause retail and wholesale prices to rise. For example, PTI member companies told the Commission at a meeting on November 2, 2009 that the new blade guards being added to their table saws cost an extra $30 to $50, but wholesale and retail prices did not change as a result of those increased costs. Also, over the last several years the cost of raw materials used in manufacturing table saws, such as cast iron and aluminum, have risen, but those rising costs have not always resulted in increased wholesale and retail prices. Additionally, manufacturers who choose to raise prices in response to increased manufacturing costs might do so in different amounts.

[40] The SawStop saw sells for $2,999 at retail. In December, 2011 the Delta saw was advertized at $3,299 on amazon.com, and at the beginning of February, 2012 was advertized at $2,999.

Visited 05/12/2016

Accordingly, the impact on prices of adding active injury mitigation technology to table saws cannot be determined with certainty. Nevertheless, the potential impact on wholesale and retail prices can be approximated by understanding the manufacturing cost of the additional components needed to implement active injury mitigation technology. The additional components necessary to implement an active injury mitigation system like that used in SawStop saws cost $58.68, and the additional components necessary to implement an active injury mitigation system like that developed by the PTI cost $55, as explained in response to request number 7. Retail prices of consumer products are typically twice the manufacturing cost, and therefore, the impact on retail price from the SawStop or PTI active injury mitigation systems might be $110 to $120 if the additional costs and additional profit margin are added to the retail price. Wholesale prices of table saws are around 20% less than retail prices.

Some comments submitted in response to the ANPR assume that active injury mitigation technology will cause retail prices to increase much more than $110 to $120 because the retail prices of some of SawStop's saws are more than the prices of other saws. However, the difference in price between SawStop saws and other saws is not primarily due to the active injury mitigation technology. As stated, the manufacturing cost of the additional components required for the active injury mitigation system in a SawStop saw totals $58.68. Any remaining difference in price would be a result of several factors, including SawStop saws having an overall higher quality than other table saws, higher manufacturing costs due to SawStop saws being manufactured in small quantities, higher allocations of fixed costs because SawStop sells only a few products to which its fixed costs can be allocated, SawStop distributing its saws through

Visited 05/12/2016

dealers that provide high levels of customer service in exchange for higher retail markups, and SawStop funding further research and development by pricing saws with higher profit margins than typically earned when competitive products are available in the market. In fact, since SawStop has said it will license its technology to all competitors if performance standards are mandated, SawStop will likely have to reduce its margins at that time in order to remain price competitive in the market.

It is important to note that the manufacturing costs discussed above represent a ceiling rather than a floor. As manufacturers adopt active injury mitigation technology, they will almost certainly make refinements and improvements that will lower costs, and therefore, the prices paid by consumers for active injury mitigation technology in the future will likely be lower.

Visited 05/12/2016

Request:

9. Expected impact of technologies that can address blade contact injuries on utility and convenience of use;

Response:

Active injury mitigation systems like those used in SawStop saws and in the PTI prototype saw increase the utility and convenience of use of table saws. Table saws with active injury mitigation systems are safer, and therefore, more people are likely to use table saws and benefit from the utility they provide. Additionally, active injury mitigation systems function without requiring any special operation or action by users.

Any negative impact on table saws from active injury mitigation technology is negligible. Users likely will have to bypass the technology to cut conductive material, but cutting such material is relatively rare. Additionally, activations of the technology caused by conductive material contacting the blade when the safety system is active are relatively rare.

Some comments submitted in response to the ANPR say that the active injury mitigation system in SawStop saws triggers when cutting wet wood. That allegation is incomplete. The injury mitigation system in SawStop saws triggers when an object similar in conductivity and capacitance to a human body contacts the spinning blade. For example, if a metal tape measure contacts the spinning blade the injury mitigation system would activate because the tape measure is conductive and has a capacitance similar to a human body. Wet wood is rarely sufficiently conductive and rarely has a capacitance similar to a human body. Some pressure treated wood that is also

Visited 05/12/2016

extremely wet might be sufficiently conductive and might have a capacitance similar to a human body because of the chemical compounds (typically copper based) used in the pressure treating process. If it is, then the injury mitigation system would activate when the material contacts the spinning blade. Activations of the SawStop system caused by wet pressure treated wood are rare.

Visited 05/12/2016

Request:

10. Information on effectiveness or user acceptance of new blade guard designs;

Response:

The PTI says a new safety standard is unnecessary because its members have developed new blade guards. The new blade guards, however, cannot be a sufficient solution to the problem because they still must be removed for many tasks performed on a table saw, such as cutting a notch in a board. Moreover, many consumers never use the new blade guards or use them only infrequently, as discussed above in response to request number 5. Furthermore, while some consumers may use new blade guards more than they used old blade guards, nothing makes the new guards any safer than the old guards when in use. Both guards pivot up to allow a board to contact the blade, and therefore, pivot up to allow a hand to contact the blade in an accident. Accordingly, a substantial number of blade contact accidents will continue to occur even with new blade guards in place.[41]

[41] The Commission's 2007-2008 survey reports that blade guards were being used in 30.9% of table saw accidents. The PTI, however, on its website at powertoolinstitute.info, says: "In four years since the introduction of the new guarding systems, there has been only one reported blade contact injury on a table saw with the new guard system." The PTI's statement is false. SawStop knows of four such injuries, even though SawStop learns of the injuries only when injured parties contact SawStop. One such injury is the subject of a lawsuit titled *Lopez v. Sears, Roebuck and Co.*, BC449595 (Sup. Ct. Cal., County of Los Angeles – Central District, filed Nov. 16, 2010). Another lawsuit involving a table saw equipped with a new blade guard is *Rojas v. Robert Bosch Tool Corp.*, 2011-L-010923 (Circuit Ct. Ill., Cook County, filed Oct. 20, 2011). Another injury involving a table saw equipped with a new blade guard was the subject of a letter dated April 11, 2011 from Indiana Insurance to DeWalt Industrial Tool Co. notifying them of an injury to Jose Luis Aragon. Stanley Black & Decker, the owner of DeWalt, acknowledged the injury in a letter dated May 5, 2011. Additionally, Paul

There is also a question whether the new blade guards developed by PTI members meet Occupational Safety and Health Administration (OSHA) regulations. Specifically, 29 CFR 1910.213(c)(1) requires each table saw to "be guarded by a hood which shall completely enclose that portion of the saw above the table and that portion of the saw above the material being cut." The new blade guards developed by the PTI members do not enclose the rear sides of the blade.

The OSHA regulation also says the hood "shall be so designed as to protect the operator from flying splinters and broken saw teeth." The new blade guards developed by the PTI members include an opening along the top that is supposed to improve visibility of the blade. That opening, however, allows splinters and broken saw teeth to be ejected by the blade toward the user. This is the same accident scenario the PTI complained of when saying SawStop technology reduces the use of blade guards and thereby "will result in an increased rate of facial or eye injuries from high velocity particles ejected by the saw blade …."[42]

Johneas was injured on a table saw with a new guard, specifically, a Sears model 351.218330 table saw made by Techtronic Industries.

[42] *Facts About Table Saw Safety Standards*, Power Tool Institute, Inc., June 14, 2011, page 1.

Visited 05/12/2016

Request:

11. Information on manufacturing costs of new blade guard designs;

Response:

Techtronic Industries spent $57,000 on the mechanical guarding joint venture from 2003 through the end of 2008, or approximately $10,000 per year.[43]

SawStop spent in excess of $100,000 on the development of its dust-collecting blade guard and in excess of $50,000 in the development of its Micro-Guard.

[43] *Montoya v. Techtronic Industries*, CV 10-1222-GHK (FFMx) (C.D. Cal.). See Defendants' Responses to Plaintiff Richard Montoya's Second Set of Interrogatories, response to interrogatory number 3, answer verified by Wayne Hill on Aug. 19, 2011 (copy attached as Appendix 3).

Visited 05/12/2016

Request:

12. Information on usage rates of new blade guard designs;

Response:

See the discussion in the response to request number 5 under the heading "Riving Knife and Blade Guard Usage and Effectiveness."

Visited 05/12/2016

Request:

13. Information on U.S shipments of table saws prior to 2002, and between 2003 and 2005;

Response:

No response.

Visited 05/12/2016

Request:

14. Information on differences between portable bench saws, contractor saws, and cabinet saws in frequency and duration of use;

Response:

Cabinet saws and contractor saws are bigger, more capable, and more expensive than portable bench table saws, and therefore, SawStop believes those saws are generally purchased by customers who use saws more frequently. For the same reasons, SawStop believes that higher priced bench table saws are used more frequently than lower priced bench table saws.

This is consistent with the life testing performed on motors for bench table saws. Bench table saws include universal motors, and manufacturers of those saws priced at retail up to around $300 or $400 commonly test those motors to run between 100 and 200 hours. Manufacturers of more expensive bench table saws may test their motors to run 500 hours. Cabinet saws and contractor saws normally include induction motors which last longer than universal motors. Manufacturers generally do not perform life testing on induction motors because the motors last too long to make such testing practical, but the motors are guaranteed for one or more years. For example, SawStop guarantees the motors on its industrial cabinet saws for five years, the motors on its professional cabinet saws for two years, and the motors on its contractor saws for one year. This information supports the conclusion that cabinet saws and contractor saws are used more frequently than bench table saws.

Visited 05/12/2016

Request:

15. Information on differences between saws used by consumers, saws used by schools, and saws used commercially in frequency and duration of use;

Response:

No response.

Visited 05/12/2016

Request:

16. Studies, research, or data on entry information of materials being cut at blade contact (i.e., approach angle, approach speed, and approach force);

Response:

In a SawStop saw, a brake cartridge records the electrical signal on the blade whenever the brake cartridge activates to stop the blade, as explained above in response to request number 5. The recorded electrical signal can be analyzed to obtain information about the event that caused the cartridge to activate. Whether a person contacted the teeth of the blade or the side of the blade is one piece of information that typically can be obtained by analyzing the recorded electrical signal. In SawStop's data, 92% of the accidents involved contact with the teeth of the blade (1,075 out of 1,169) and 8% involved contact with the side of the blade (94 out of 1,169).

Users reporting accidents on SawStop saws are asked to provide descriptions of their accidents. Of those providing a description, approximately 50% said the accident happened inadvertently as they were cutting a workpiece (582 out of 1,169). About 23% said the accident happened when they were removing material from the saw (271 out of 1,169), about 18% said the accident happened because of kickback or because the workpiece shifted or rode up on the blade (212 of 1,169), about 8% said they slipped or flinched (90 out of 1,169), and about 1% said the accident happened for some other reason (14 out of 1,169), such as catching a glove on the blade (5 out of 1,169) or touching the blade when lifting the blade guard (2 out of 1,169).

Visited 05/12/2016

Request:

17. Information that supports or disputes preliminary economic analyses on the cost of employing technologies that reduce blade contact injuries on table saws;

Response:

The estimated $2.36 billion in societal costs each year from table saw blade contact injuries excludes economic costs from deaths because the Commission "determined that deaths resulting from blade contact during table saw use are rare and appear to be the result of secondary effects of the injuries (e.g., heart attack) rather than the injuries themselves."[44] While deaths from blade contact accidents are rare, they do happen and could be considered. For example, in 2010, a 45 year old father of four died in his garage when he fell on a table saw and the blade cut into his chest.[45]

The ANPR states that "current systems designed to address blade contact injuries on table saws appear to be costly and could substantially increase the retail cost of table saws, especially among the least expensive bench saws."[46] However, as explained above in response to request number 7, the current cost of additional components necessary to implement an active injury mitigation system like that used in SawStop saws is $58.68, and an active injury mitigation system like that used in the PTI prototype adds $55 to the manufacturing cost of the saw.

---

[44] *ANPR*, 62681, top of right column.

[45] Copies of the police report related to that death, with names and locations redacted to protect the family's privacy, are attached as Appendix 4.

[46] *ANPR*, 62681, middle of right column.

Visited 05/12/2016

Request:

18. Studies, research, or data on appropriate indicators of performance for blade-to-skin requirements that mitigate injury;

Response:

See the response to request number 2.

Visited 05/12/2016

Request:

19. Studies, research, or data that validates human finger proxies for skin-to-blade tests;

Response:

SawStop uses hot dogs as human finger proxies for skin-to-blade tests of its active injury mitigation system. SawStop saws include a contact detection system that senses the human body's capacitance and conductivity. A hot dog, when held in a person's bare hand, provides a conductive path to the human body, and therefore, the contact detection system senses the human body's conductivity and capacitance through the hot dog. This has been validated by thousands of tests, and by comparing electrical signals from brake cartridges that were triggered in real-world accidents with electrical signals from brake cartridge used in hot dog tests.

Other active injury mitigation systems, however, may implement different detection methods. For example, other systems might use radar detection, heat detection, color detection, motion detection, or image detection. In those systems, hot dogs may not be an appropriate proxy for a human finger.

Because of the different possible detection methods, there is no single proxy for a human finger. The human finger proxy will depend on the detection method adopted by a manufacturer. Accordingly, in the performance standard suggested by SawStop in response to request number 2 above, a table saw manufacturer must supply an appropriate proxy to the Commission when necessary for testing, and the manufacturer must provide documentation showing how the proxy is an appropriate finger surrogate.

Visited 05/12/2016

Request:

20. Studies, research, or data on detection/reaction systems that have been employed to mitigate blade contact injuries;

Response:

See the SawStop data referenced in response to requests numbers 1 and 6.

Visited 05/12/2016

Request:

21. Studies, research, or data on the technical challenges associated with developing new systems that could be employed to mitigate blade contact injuries;

Response:

No response.

Visited 05/12/2016

Request:

22. Studies, research, or data on guarding systems that have been employed to prevent or mitigate blade contact injuries;

Response:

See the data concerning blade guard usage and effectiveness discussed in response to request number 5.

Visited 05/12/2016

Request:

23. Studies, research, or data on kickback of a workpiece during table saw use;

Response:

Tom Hintz is a woodworker from Concord, North Carolina who publishes a website called NewWoodworker.com. On February 16, 2012 he posted a report discussing kickback and he called the report "Kickback on Camera." The post includes a video in which Mr. Hintz pushes a board past a spinning blade to make a cut. As the trailing edge of the board moves toward the rear of the blade, Mr. Hintz shifts the board toward the blade. The blade then grabs the board and kicks it back past the front of the saw. When this happens, Mr. Hintz's hand comes extremely close to the blade before he can react.

SawStop contacted Mr. Hintz and asked if SawStop could reproduce and use his video to educate others about kickback. Mr. Hintz agreed and sent copies of his original video footage to SawStop. Relevant portions of that footage are reproduced on a CD-ROM attached as Appendix 5.

Mr. Hintz was using a push-block to move the board past the blade. A push-block is a device that allows a user to keep his hand away from the blade as he moves a board past the blade. A user grips a handle on the push-block, places the push-block against the board, and then pushes the block forward. The board moves with the push-block because of friction or interference between the push-block and the board. The bottom of Mr. Hintz's push-block included a high-friction material to maximize the grip of the push-block on the board.

Visited 05/12/2016

When Mr. Hintz shifted the board toward the blade, the rear portion of the blade caught the board, lifted it up, spun it around, and shot it back toward the front of the saw. Initially, the push-block and Mr. Hintz's hand moved with the board because of the friction between the push-block and the board and because of Mr. Hintz's grip on the push-block. Within milliseconds, however, the blade jerked the board out from under the push-block. The push-block, suddenly lacking support from the board, then moved into the blade, and the blade ripped the push-block out of Mr. Hintz's hand. That action accelerated Mr. Hintz's hand and caused it to almost hit the blade.

Watching the video footage frame by frame shows the details of what happened. The relevant frames are reproduced in a series of still images attached as part of Appendix 5. The still images in Appendix 5 are arranged in rows, with each row having two images. On the left of each row is a larger image captured from video footage taken by a camera positioned to the side of the blade. On the right of each row is a smaller image captured from video footage taken by a second camera positioned behind and above the back of the blade. SawStop superimposed a grid over each of the larger images in order to measure movements of the board, push-block and hand. Each square on the grid represents 1 square inch, and the grid is sized to correspond to the dimensions of the board, which are known to be $11^{1}/_{16}$ inches long by 4½ inches wide by $^{15}/_{16}$ inches thick. SawStop also superimposed a time counter in the lower right corner of each large image. The numbers "00:08" and "00:09" in the time counter correspond to eight or nine seconds into the video. The video plays at 60 frames per second, and the number to the right of the semicolon in the time counter identifies the frame. Thus, the designation "00:08;45" represents frame 45 of the eighth second of the

Visited 05/12/2016

video. The smaller image to the right of each row corresponds in time to the related larger image.

In frames 45 through 54 of the eighth second, the board is shifting toward the rear edge of the blade. The teeth rising out of the table at the rear of the blade cut into the side of the board and start to lift and spin the board, as seen in frames 55 through 57. Once the board is lifted, the blade kicks it toward the front of the saw, as seen in frames 58 and 59, and the board is out of the image by frame 00 of the ninth second. Mr. Hintz hung up a tarp about 8.5 feet away from the blade to catch the board, as seen in the video, and the board hits the tarp at about frame 06 of the ninth second. That means the board travels approximately 8.5 feet between frame 59 of the eighth second and frame 06 of the ninth second, so the average velocity of the board during those frames is about 73 feet per second.[47]

The push-block and hand accelerate and move with the board up to frame 57 of the eighth second, after which the board breaks free of the push-block. The push-block and hand continue moving even though the board has broken free, and the push-block moves into contact with the blade in frame 59. The blade then catches the push-block and jerks it out of Mr. Hintz's hand sometime around frame 01 of the ninth second. The sudden acceleration of the push-block further accelerates Mr. Hintz's hand, and the knuckle on Mr. Hintz's index finger moves almost two inches between frame 00 and frame 01 of the ninth second. That corresponds to a velocity of about 120 inches per second. [48]

---

[47] Calculated as follows: (8.5 feet) / (7/60 of a second) = 73 feet per second.

[48] Calculated as follows: (2 inches) / (1/60 of a second) = 120 inches per second.

Visited 05/12/2016

Frames 02 and 03 of the ninth second show Mr. Hintz's hand and index finger moving further toward the blade. Mr. Hintz does not react until sometime between frames 03 and 04 of the ninth second when he starts to pull his hand away from the blade. However, when he does so, he almost pulls his index finger into the blade, as seen in the smaller images corresponding to frames 04, 05 and 06 of the ninth second.

Mr. Hintz's video footage shows that a hand can reach a velocity of around 120 inches per second in an accident involving kickback, at least in the case where the hand is gripping a push-block and the blade catches the push-block. The velocity imparted to the hand almost certainly would have been less if Mr. Hintz were not using a push-block because his fingers would not have been wrapped around a handle.

Although Mr. Hintz's hand reached a high velocity, it is important to understand that the largest component of that velocity was in a direction toward the front of the saw; not in a direction radially inward toward the axis of the blade. Understanding this fact is important because it is only the velocity of the hand radially inward toward the axis of the blade that affects how deep a person will be cut, not the velocity of the hand toward the front of the saw. The radial velocities of hands in accidents, including accidents involving kickback, are discussed in response to request number 5 above, and those velocities are typically on the order of 3.6 inches per second for accidents treated with a bandage or less, or 14.5 inches per second for accidents treated with stitches or by a doctor or hospital. If hands were moving radially into blades faster, SawStop's data would include injuries which are more severe. The fact that SawStop's data does not include injuries which are more severe shows that hands typically do not move radially inward at high velocities, even in accidents involving kickback. It is also important to

Visited 05/12/2016

remember that even if in rare cases kickback accidents cause hands to move radially inward at high velocities, active injury mitigation technology would still mitigate injuries compared to saws without the technology.

This point bears repeating because focusing primarily on the maximum velocities a hand might reach in a kickback accident could lead to a mistaken conclusion that active injury mitigation technology would not be effective. Human hands clearly can move in excess of two meters per second when reaching across a table saw, and they can reach even higher velocities in some accidents, as powerfully illustrated by Mr. Hintz's video. However, the only component of the velocity relevant in evaluating the effectiveness of active injury mitigations systems is the component that moves the hand in a direction where it will be cut more deeply, and that is in a direction radially inward toward the axis of the blade. Unfortunately, it is effectively impossible to construct experiments to accurately measure that component of velocity due to the dangers of using human subjects in such experiments and the impossibility of accurately replicating the dynamics in any other way. Fortunately, however, the real-world data collected from actual accidents on SawStop saws clearly shows that hands are not moving radially inward toward blades at high velocities. In over 1,300 reported accidents, many involving kickback, there has not been a single instance of an injury that would indicate hands are moving radially into blades at velocities high enough to render active injury mitigation technology ineffective.

The effectiveness of active injury mitigation technology in accidents involving kickback is discussed in response to request number 6 above.

Visited 05/12/2016

Request:

24. The costs and benefits of mandating a labeling or instructions requirement;

Response:

See the discussion of a possible labeling rule in response to request number 1.

Request:

25. Other relevant information regarding the addressability of blade contact injuries.

Response:

The PTI says "SawStop saws are available to any consumer who chooses to purchase them."[49] Similarly, many comments to the ANPR say instead of mandating safety technology, consumers should be allowed to choose whether to buy safety technology, and if they are injured as a result of their choice, it's their own fault. Unfortunately, that course imposes a heavy and unnecessary burden on society. Individuals who choose to buy saws without injury mitigation technology do not pay all the costs associated with the injuries occurring on those saws; society pays a large portion of those costs through higher insurance premiums, workers' compensation, disability payments, etc. In short, society heavily subsidizes the cost of table saws by bearing a large portion of the cost of injuries. While the PTI and some woodworkers might like to maintain that subsidy to keep the price of table saws artificially low, the better choice is to adopt new safety technology and thereby eliminate those costs altogether.

The PTI and some comments to the ANPR also say new safety standards would cause the retail prices of table saws to increase to a level where many consumers would no longer be able to buy a table saw. While it is true that the retail prices of at least some table saws will likely increase, it is also true that the overall cost of table

[49] *Facts About Table Saw Safety Standards*, Power Tool Institute, Inc., June 14, 2011, page 1.

Visited 05/12/2016

saws will decrease. The question is whether the decrease outweighs the increase - and it does by a substantial margin.[50] In reality, a new safety standard would dramatically reduce overall costs and rightly shift any remaining costs from society to those who actually use the saws.[51]

The PTI and some comments to the ANPR also say a new safety standard would mandate a particular table saw design sold by SawStop. That is not the case. A new safety standard would require a specific level of protection for the user, but would not say how that protection must be achieved. The standard would not, for instance, require the blade to be stopped on detection of user contact with the blade, as happens in SawStop table saws, or require a blade to retract, as happens in the PTI prototype saw. Instead, a new standard would be a performance standard and table saw manufacturers would be free to adopt any design that meets the specified performance.

---

[50] The societal cost of accidents would be reduced by approximately $326 million in the first year alone, and those costs would be reduced by approximately $1 billion annually within six years, as explained in response to request number 4. Any increase in retail prices due to active injury mitigation technology would likely be on the order of $110 to $120 given that the manufacturing cost of additional components needed to implement active injury mitigation technology is $55 to $75, as explained above in response to request numbers 6 and 8.

[51] Interestingly, PTI member companies are currently developing new voluntary standards to require bench table saws to be bigger and heavier. Specifically, PTI member companies are supporting changes to IEC 61029-2-1 that require bigger table tops than currently found on small bench top saws (clause 21.104.2), and that require saws not to tip over or move when various forces are applied to the saw (clause 19.7.101). Those requirements will almost certainly eliminate the $100 to $150 bench table saws from the market and cause the retail prices of other bench table saws to increase. Nevertheless, PTI member companies justify the price increase by saying the changes will make saws safer. Apparently PTI member companies think the danger of a small work surface and the risk of a saw tipping justify retail price increases, but the danger of a spinning blade does not, even though most table saw accidents involve contact with the spinning blade.

Visited 05/12/2016

Nevertheless, the PTI says even if a new safety standard is written as a performance standard, it still should not be adopted because table saw manufacturers would have to license SawStop patents to meet the required performance. The PTI's allegation, however, would be true only if a table saw manufacturer decided to include one of SawStop's inventions in its design. Similarly, if a table saw manufacturer adopted one of the PTI's inventions, it would have to license PTI's patents. And even if a manufacturer decided to include a SawStop or PTI invention in its design, the cost of a royalty would be insignificant when weighed against the benefits of reduced injuries. For example, SawStop has said it will license its inventions for 8% of the wholesale price of the saw.[52] At that rate, the royalty on a saw that sells for $160 wholesale (or about $200 at retail) would be less than $13.

Moreover, the fact that SawStop, the PTI, individual power tool manufacturers, and other entities have patents or patent applications protecting inventions related to active injury mitigation technology should not control whether a new safety standard is adopted. That decision should depend on an analysis of the costs and benefits to society from the new standard. If a patent license is required for some manufacturers to comply with the new standard, that cost should be considered and weighed against the benefits. But society should not have to bear the horrendous cost of table saw blade contact injuries simply because the PTI complains that its members might have to

[52] Techtronic Industries ("TTI") and Emerson both agreed to an 8% royalty before deciding to join with other manufacturers in opposition to active injury mitigation technology. Their agreement to an 8% royalty shows that an 8% royalty is reasonable. At the time, TTI made Craftsman table saws for Sears and Emerson made Ridgid saws for Home Depot. Emerson has now left the table saw business. TTI currently makes Ryobi table saws and Ridgid table saws for Home Depot.

Visited 05/12/2016

license one or more patents. That approach would subordinate society's interest in addressing table saw blade contact injuries to manufacturers' attempt to avoid the cost of implementing new technology. Again, whether a new safety standard is warranted should depend on an analysis of the costs and benefits to society, not on manufacturers' desire to avoid a patent license.

Additionally, the PTI's frequent complaints about SawStop's "web" of patents creating a "monopolistic advantage" are disingenuous because the PTI itself, along with many of its members, have created their own "web" of patents related to active injury mitigation technology. This is shown by the many patents and patent applications listed in Appendix 6.

The fact that SawStop, the PTI, PTI member companies, and others have all sought patents to protect their inventions relating to active injury mitigation technology should not be surprising. Most if not all businesses that invest in research and development seek patents to protect their inventions. In fact, it is the patent system that motivates innovation by providing a mechanism for inventors to earn a reasonable return on their research, investment and development. For example, the SawStop technology likely would never have reached the marketplace were it not for the protection offered by patents. SawStop could not have raised the capital necessary to design and market a new line of table saws if investors did not see a potential for earning a return by selling products protected by patents or by licensing patents to others.

What the PTI and its members are really complaining about is that SawStop was the first to invent feasible injury mitigation systems, and as a result, SawStop has been

Visited 05/12/2016

able to obtain patents on those systems. But again, whether the Commission should adopt a new safety standard should depend on the costs and benefits to society from the standard, not on whether SawStop, the PTI, or some other entity has patents.[53]

Finally, the cost to develop implementations of active injury mitigation technology is modest compared to the potential savings from mitigated injuries. Two members of the PTI joint venture have disclosed how much they have invested in active injury mitigation technology. Delta International Machinery invested $370,043 from 2003 through 2004,[54] and Techtronic Industries invested $815,043 from 2003 through 2008.[55] By way of comparison, SawStop invested approximately $3 million from 2001 to 2004 to develop saws with active injury mitigation technology.

---

[53] The PTI also says a new standard would "undermine and remove any incentive to the development of future new alternative table saw safety technology." (See powertoolinstitute.info.) To the contrary, the petition for a new safety standard has already motivated much innovation, as shown by the patents and patent applications listed in Appendix 6, and a new safety standard would similarly incent businesses to invent new and less expensive systems to meet the new standard.

[54]The $370,043 amount was disclosed by Delta in *Schmidt v. Pentair*, C08-04589 EMC (N.D. Cal., settled July 2011). See Delta International Machinery, Corp.'s Response to Plaintiff's Special Interrogatories, Set One, response to interrogatory number 4, answer verified by Richard Schafebook on Aug. 28, 2009 (copy attached as Appendix 7). Delta International Machinery Corp. was a subsidiary of Pentair Corporation until Black & Decker purchased Delta (and Delta's sister company, Porter-Cable) in 2004 for around $775 million. Pentair's revenues in 2004 were approximately $2.28 billion.

[55] The $815,043 amount was disclosed by Techtronic Industries in *Montoya v. Techtronic Industries*, CV 10-1222-GHK (FFMx) (C.D. Cal.). See Defendants' Responses to Plaintiff Richard Montoya's Second Set of Interrogatories, response to interrogatory number 3, answer verified by Wayne Hill on Aug. 19, 2011 (copy attached as Appendix 3). Techtronic Industries' revenues in 2004 were approximately $2.09 billion in US dollars.