September 20, 2017

Hello,

To everyone who has raised questions about shuffler speed and productivity, we've prepared a brief overview for your consideration, and we remain steadfast that the Shark Trap shufflers will outperform the competition, and dramatically so!

We welcome you to visit our booth at the G2E (Booth #1937) and see our alpha-prototypes. We'll also be demonstrating Shark Trap's *Orientation Design Detection System*, the first system of its kind to detect all forms of manufacturing asymmetries.

Game-protection experts claim that 70%+ of all casino cards exhibit some form of discernable asymmetry, while a few of the best advantage players have publically boasted that almost 100% of all cards are readable. Whatever the case happens to be, it's clearly a problem that's not going away anytime soon, continuing to create doubt in the minds of operators and forcing them to respond with costly, often ineffective countermeasures. Shark Trap's *Orientation Detection Design System* finally solves the problem. The system is foolproof and works with any back design or form of asymmetry despite the degree of variance, and we look forward to sharing our groundbreaking system with all interested parties.

Regards,

Lou DeGregorio
President

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SHARK TRAP SHUFFLER PRODUCTIVITY ANALYSIS

Shark Trap's (ST) shufflers offer many benefits including game security, lower card costs, no-batch formats, and much more. This overview, however, specifically looks at the productivity advantages of ST's novelty-game shuffler compared to Shuffler Master's *i-Deal*, and of ST's round-to-round multi-deck shuffler compared to Shuffle Master's *MD3*.

There are four kinds of casino shuffling machines. The most common are 'pseudo rifflers' (e.g., *MD3*), continuous shufflers (e.g., *one2six*), and random-position shufflers (e.g., *i-Deal*). The rarest of the casino shufflers, however, is the 'random-selection' shuffler, which utilizes a methodology that shuffles/moves each card from randomly selected positions in the unshuffled deck to the shuffled deck, first selecting and shuffling any card from 1-52, 1-51, 1-50, and so on, until the shuffle is complete. This is the most efficient method of shuffling as no final step is required to dispense the cards from positions, shelves, slots, or compartments into individual hands (or complete decks). ST's shufflers can shuffle/move cards from unshuffled decks directly

to the layout where complete hands in novelty games can be immediately dealt, effectively *shuffling and dealing simultaneously*!

Conversely, random-position shufflers, like *i-Deal*, drive cards individually off the bottom of the unshuffled deck into randomly selected compartments in a carousel, but then require an additional electromechanical action to dispense the cards into complete hands before they can be presented to the dealer.

Additionally, with the exception of continuous shufflers, all modern shufflers are batch-system shufflers that require two decks or sets of decks to be used in rotation. In this overview, we highlight ST's no-batch shufflers where only one deck or set of decks is required.

Shark Trap's Novelty-Game Shuffler versus Shuffle Master's i-Deal

Opening New Games

Opening up one-deck games with ST's no-batch shufflers is faster than with traditional batch shuffler for two reasons: (a) only *one new deck* needs to be inspected and loaded into the shuffler, and (b) a complete shuffle is not required before the first hand can be dealt. With ST's no-batch shufflers, once the sole deck is inspected, picked up, and loaded, shuffling and dealing is almost immediate, allowing the deal to begin in seconds.

With the *i-Deal* (batch shuffler), the process is significantly longer because (a) two decks need to be inspected, and (b) a complete shuffle of the first deck in the batch system is required before the cards can be dispensed/formed into the first hand for the deal.

Re-starting Dead Games

Re-starting dead games is faster with ST's no-batch shufflers than with the *i-Deal* for the same reasons. When novelty games go dead, the standard procedure mandates dealers to remove both decks from the shuffler and spread them on the layout. To restart with *i-Deal*, players must wait for two decks to be loaded and one complete shuffle before the dispensing/forming of the first hand for the deal.

To restart a game with ST's no-batch shuffler, dealers only need to scoop up the deck, load it into the shuffler, and immediately begin to deal—there's virtually no downtime!

Depending on the day and time, games can go dead *several times during a single shift,* thus the re-starting process with *i-Deal* can result in significant downtime, perhaps several minutes per table, per shift.

Changing Decks

Changing decks with the *i-Deal* requires that two decks are changed, inspected, washed/scrambled, and one deck is completely shuffled before the first hand can be dispensed/formed to start the deal.

Changing decks with ST's no-batch shufflers only require that the new deck is loaded into the shuffler, which is immediately followed by simultaneously shuffling/dealing the first hand. Even if operators insist on the traditional inspection and washing/scrambling procedures, changing decks is significantly faster with ST's novelty-game shuffler.

Shuffler Positioning

ST's novelty-game shuffler is always positioned to the dealer's left—the optimal position. In any game where the deal traditionally starts to the dealer's left and moves clockwise, positioning the shuffler closest to the first-player position will produce more hands as compared to positioning the shuffler to the dealer's right. The reason? The player-decision period starts faster. With the shuffler to the dealer's left, assuming a full game, the distance from shuffler to the first player position is just inches in a full game, so the first hand is dealt over a shorter distance to start the deal than if the shuffler was to the dealer's right where the first hand would have to be dealt and move from the dealer's right to left to start the deal. Putting the cards in the players' hands faster can reduce overall player decision time on average. Positioning the shuffler to the left is also consistent with the traditional position of dealing shoes, so the actions of feeding with the left hand and dealing with the right hand are familiar movements to most dealers, and familiar actions are more efficient. Some games, like *Hold'em* and *Pai Gow Poker*, are not affected as described. In *Hold'em*, a dealer button moves from player to player, moving the starting position of the deal from position to position. In *Pai Gow Poker*, the starting position of the deal is randomly selected so the first hand is just as likely to be dealt to any position.

Ergonomic Considerations

From an ergonomic standpoint, ST understands that the optimal positioning of the shuffler is based on many factors that change from dealer to dealer (e.g., a 5' 6" dealer may prefer the shuffler at a different angle than a 6' 5" dealer). Ergonomics is all about comfort and ease of use. To maximize comfort and therefore the productivity of the individual dealer, ST's shufflers have been designed so they can move and swivel two inches in any direction and then be locked into position.

Although it's difficult to quantify the benefits of this feature, it can only be positive, and it illustrates another example of ST's quest to design the perfect shuffler.

The Dealing Action

ST's novelty-game shuffler shuffles/deals directly to the table, allowing dealers to *slide each hand* to the appropriate positions. Conversely, *i-Deal* requires that each hand is *lifted* out of a recessed dealing bin and dealt in an arcing motion. Although the difference in time between sliding and lifting/lowering each hand is only a fraction of a second, it's a lag that occurs on the deal of *every single hand*! In a 30-rounds-per-hour game with six players and the dealer, and assuming a core game that runs 24 hours a day, dealers will deal over 5000 individual hands and even fractions of a second can add up quickly (30 rds x 7 positions x 24 hrs = 5040 hands dealt). Even with a lag of only a 0.25 second per dealing action, the time-and-motion loss is 21 minutes of downtime for just this game over 24 hours: (5040 hds x 0.25 secs)/60 secs = 21 minutes.

In short, when the cards/hands are slid directly from the table to each position, it's the shortest distance between two points and results in a more productive procedure. It's also a much safer procedure that provides protection against the professional hole-card teams that have been exploiting the unintentional flashing of holecards from shufflers for a long time—a serious, ongoing problem.

Dealing Confirmation

Spreading each hand as it's dealt to confirm that the shuffler presented the correct number of cards is a carryover procedure from the early shuffler days. It was implemented to detect misdeals, but it's still prevalent. When individual hands are spread for confirmation, another minor lag occurs during the deal of every individual hand.

Though the industry has standardized procedures for handling misdeals in the different games, when games are dealt with shufflers, the industry is still willing to slow the games down to avoid embarrassing incidents—none of which is necessary with ST's shufflers.

Dealing Speed

The *i-Deal forms* individual hands internally, which are then lifted via an elevator and pushed through a slot into a receiving/dealing bin. This process allows hands to be dealt at about one hand every two seconds by the fastest dealers. ST's novelty-game shuffler, however, randomly selects and moves each card into a completed hand at about three cards per second, so at first glance, it looks as if *i-Deal* would be slightly faster in games like *Pai Gow Poker* and *High Card Flush* where each hand consists of seven cards, but many other factors must be considered.

Although the *i-Deal* may be slightly faster initially, this is only true when dealers are dealing at a pace of one hand every two seconds—when the dealing pace is slower, there's no difference. Moreover, after ST's shuffler randomly selects and shuffles the first seven-card hand, subsequent hands are dealt from smaller and smaller subsets, which occur faster and faster, providing competitive dealing speeds.

There are only a couple of games under certain conditions that ST's novelty-game shuffler may produce slower dealing speeds for the first few hands. But it catches up quickly, and when all gains are combined, it's not even close: ST's shuffling methodology is decidedly faster, generating superior gains in productivity.

Jams/Malfunctions

All shufflers jam and malfunction from time to time, causing downtime. Examples of malfunctions are misdeals, missing cards, and component failure. Misdeals generally occur when a player is dealt too many cards or not enough cards. ST's shuffling methodology makes it *physically impossible* for two cards to be processed as "one" since each card must pass under a gap that only allows one card to pass. Additionally, a sophisticated vacuum system ensures card singularity and separation from adjacent cards, effectively eliminating any concerns about moisture or sticky cards.

Another form of malfunction is the infamous "missing card," which occurs when a card ends up in some unintended part of the shuffler, a problem that is much more likely in large, complex machines with many compartments, elevators, etc. The missing-card problem is not possible in ST's shufflers because there's nowhere for a card to hide before, during, or after the shuffle. The cards start in a protected preshuffle bin, travel the shortest possible distance (the width of a playing card), and are shuffled directly to the table.

After conferring with numerous operators over the last several months, the consensus is that most malfunctions are rare, so let's give credit where credit is due. Shuffle Master's shufflers are considered to be "generally" reliable, although failure rates according to many are still estimated to be about one jam per machine per day, and when a jam requires physical intervention, the recovery takes time. It was also suggested that most jams occur in *Pai Gow Poker*, which makes sense as 49 cards are dealt to complete every round (despite the number of players). During the summer months, shuffler jams and malfunctions are also more common, which could be attributed to the humidity, which causes sweat and moisture from the players to be transferred to the cards, another issue that notoriously affects the performance of many shufflers. In fact, the problem reached a point where the public had to be put on notice, which is why all novelty-game shufflers depict the warning: "Machine Malfunction Voids All Payoffs."

Clearing Jams

Minimizing the inevitable shuffler jam is critical—there must be commercially acceptable failure rates—but an equally important issue is the time it takes to recover from a jam. Should a jam occur with the *i-Deal*, the two decks can be in several compartments including the preshuffle bin, postshuffle bin, on an elevator, or *in any of 52 compartments* in a carousel. Obviously, to clear all cards from an *i-Deal* could require several steps.

Clearing jams is significantly easier with ST's novelty-game shufflers. First, only one deck is in play. Second, the cards can only be in one of two places: preshuffle bin or on the table (postshuffle bin), making it an easy process to remove all the cards if necessary.

Also, it's believed that warped, bent, and crimped cards are a common cause for most jams. ST's shufflers are designed to maintain deck flatness during the shuffle/deal, after which warped, bent, and crimped cards will not affect the shuffling methodology. With ST's shufflers, after a random number of cards are stepped forward at the selected card, it's momentarily isolated with a vacuum system, electromechanically grabbed, propelled/shuffled forward, and fall to the table.

Short-Handed Games

In short-handed games (1-3 players), another common delay with the *i-Deal* occurs when a round is completed before the second deck in the batch system is finished shuffling. In these instances, the game must stop and the dealer/players must wait.

ST's novelty-game shuffler offer a streamlined dealing procedure to address this problem.

In *Three Card Poker*, assume that a round with just one player finishes quickly. The six cards can be picked up, loaded into the preshuffle bin along with the 46 remaining cards, and a new deal can begin again almost immediately by randomly selecting and shuffling any three cards *from a complete deck*—the unplayed cards remain in the preshuffle bin.

The perceived downside to this approach is that while deck verification is possible in terms of the number of cards, *absolute deck verification* is not possible. ST's shufflers can identify missing and duplicates cards *before the first card is shuffled*, but the possibility still exists—although infinitesimal—that the deck has a duplicate king of spades but is missing the ten of diamonds, for example. Is this a bona fide risk? No!

All of Shuffle Master's shufflers provide absolute deck verification during each shuffle by imaging each card as it's shuffled (value and suit). Many believe that this feature provides important protection against the classic 'hand-mucker.' These cheaters apply a modus operandi that starts with stealing one card from the game, switching cards as desired, and 'cleaning up' to reintroduce the last stolen card back into the deck. Since hand-mucking is a scam where the deck is always short, ST shufflers do not have to image each card to detect the shortage (or extra cards). Utilizing proprietary technology, detection is immediate. Moreover, thanks to the modern surveillance system, the industry hasn't seen muckers in decades and it has been even longer since a duplicate-card scam has surfaced—the rankest of scams as it carries the risk of duplicate cards ending up in a same player's or dealer's hand.

From a game-protection standpoint, if a cheater or crew of cheaters decided to scam a novelty game with a card-switching scam, card mucking and duplicate-card scams would never even be a consideration. They would use techniques where the cards are switched from *player to player*, a scam that maintains deck integrity at all times. In this regard, deck-verification features can create a false sense of security. The *i-Deal* pitches a "card recognition technology that dramatically increases table game security," but the truth is that while absolute deck verification during each shuffle provides operators with peace of mind, its imaging system does not provide protection against card switching scams (unless hands are later verified according to the cards dealt). Often the biggest advantage of this feature is to provide a checkpoint for machine malfunctions.

In concert with the streamlined dealing procedure (never dump the remaining cards), ST offers a random 'count-down' mode when dealing short-handed games. This is the same game-protection procedure used in Poker for decades where the dealer would, without notice, count down the remaining stub to insure that all cards were present. Once the shuffler is put into short-handed mode, the shuffler would automatically and randomly generate count-downs, sequentially dumping all remaining cards to provide absolute deck verification on perhaps every fifth deal or so. (ST's shufflers know how many hands are dealt to complete a round and how long it takes to deal the round, so this mode could be preset to initialize under certain conditions.)

Watching a novelty game recently with one player betting the minimum, we were surprised to see the dealer and player looking into the shuffler and waiting for each shuffle to run its course. This would have been a perfect opportunity to implement the short-handed dealing mode. The player still controls the speed of the game and can play at any desired pace. Any security concern of the player introducing a previously stolen duplicate card is practically nil. And, operating in short-handed dealing mode would not only increase the number of hands dealt per hour, but enhance the gaming experience for the player, too.

Dealing Extra, Unnecessary Hands

If the *i-Deal* is preset to deal three cards for *Three Card Poker*, for example, it continues to deal one additional three-card hand even after the dealer's hand has been dealt—extra hands are dealt in all games. At this stage the dealer hits an LED button that directs the shuffler to dump the remaining cards on top of this hand.

ST's novelty-game shuffler takes another approach. Before dealing the last hand, whether it be the dealer's hand, player's hand in *Pai Gow Poker*, or community card(s), dealers simply raise their left hand to block a sensor that instructs the machine that the next dealing action is the last dealing action (pressing the one-button user interface is also an option). Now, the instant the last hand or community card is dealt, the shuffler immediately and automatically begins dumping the remaining cards.

The *i-Deal* requires dealers to press the green LED button twice for every round dealt: once to initiate the dealing action and once to initiate dumping the remaining cards. ST's novelty-game shuffler only requires a single action from the dealer each round, and no buttons need to be pressed. Without any extraneous or unnatural movement, a small 'last-hand' sensor provides a novel user interface that can be triggered to control the entire dealing sequence of any game, even games with multiple phases/betting rounds. The beauty of ST's approach is that there are no boundaries in respect to dealing sequences; ST's novelty-game shuffler can easily handle any format or dealing sequence.

Eliminating Unnecessary and Costly Procedures

Many casinos instruct their dealers to riffle the deck once by hand before loading the deck into the shuffler. Some believe the procedure safeguards against sticky cards, while others claim that it's offered as a courtesy to the players—for those who don't trust shuffling machines. ST's position is that there's never any reason to riffle by hand before a machine shuffle, nor is there any reason to 'plug the cutoffs' (inserting the unplayed cards into the middle of the deck before shuffling). ST shufflers make it physically impossible to shuffle two cards as one, so there's protection against sticky cards, and the random-selection shuffling methodology is optimal so preshuffles are mathematically unwarranted.

ST's shufflers also have the capability to track the orientation of all cards and inform management of any sustained, exploitable orientations (edge-sorting and asymmetry-based scams), so there's no longer any valid reason to wash/scramble the cards or kill half the decks (spinning half the cards 180 degrees) before or during the shuffle.

We're also seeing convoluted procedures for the placement of the cut-card and even for *shuffling the cut-card* to prevent flashing. ST offers an elegant no-flash dealing module where the cards are shuffled directly to the table and can be slid to the appropriate position, without flashing.

Like Shuffle Master, ST's shufflers also read every card as it's dealt. Once ST's detection platform is fully developed, operators will even have the option of bypassing the traditional faceup/facedown inspection of new decks as ST's detection technology can do this job better than any dealer, which will all take place during the first shuffle!

ST's shufflers eliminate the need for most traditional procedures, and even in the modern table-game environment where shufflers are mixing the cards, hands are electromechanically formed under the table, hands are dealt in groups versus individually in the traditional fashion, and players are no longer allowed to cut the cards, few players have written off the gambling industry because their luck is decided exclusively by technology and not the shuffling/dealing skills of dealers. Although we acknowledge the benefits of many of today's *technological assistants*, the ST platform continually strives for new heights that will allow operators to maximize procedural efficiency, productivity, and profitability.

Shark Trap's Multi-Deck Round-to-Round Shufflers versus Shuffle Master's MD3

Electromechanical/Card Movements

The design of Shuffle Master's *MD3's* consists of three adjacent, vertical bins. Assume six decks, which are inserted into the center bin to begin a shuffle. The decks are first separated into two piles via rollers that randomly move the cards one at a time into the outside bins (312 movements). After approximately half the cards are in both outside bins, the cards are then randomly "riffled" one at a time back into the center bin (another 312 movements), so it takes 624 movements to riffle six decks once (312 x 2). But the *MD3* require seven complete riffles to achieve randomness—following the conclusions of the famous Diaconis study on shuffling—so we need to multiply movements by seven, which results in 4,368 movements (624 x 7). To complete the shuffle, a final step is required: the shuffled decks must be moved from the center bin to the bin closest to the dealer, one card at a time, so another 312 movements are required for a total of 4,680 electromechanical movements with each movement requiring that rollers contact the cards.

With ST's shuffling methodology (random-selection), only 312 movements are required!

To put this into perspective, it takes Shuffle Master 15 times as many electromechanical movements to shuffle six decks of cards (4,680/312). ST's multi-deck shuffler offers a staggering 93% reduction of electromechanical movements ((4,680-312)/4,680 = .9333), and the savings are about the same for eight decks!

Shuffler Speed

It takes approximately six minutes for the *MD3* to complete a shuffle. ST's traditional multi-deck shuffler will take less than three minutes, so it will be twice as fast, but everything takes a giant step forward with ST's round-to-round shuffler.

ST's round-to-round shuffler is significantly faster and more efficient. For example, in eight-deck baccarat, it only takes 10 seconds from the beginning of the shuffle to dealing the first card, allowing us to make the bold statement that ST's shuffler is approximately 36 times faster than the *MD3*! Many operators have responded to this statement, "That's impossible," but it's a fact. The ST round-to-round shuffler is 36 times faster from the beginning of a shuffle to the instant the first card is dealt (360 secs/10secs)! In percentage terms, this is 97% times faster than the *MD3* (360-10/360=.9722)!

Summary

This short overview makes no attempt to address ST's many *other advantages* over Shuffle Master's shufflers, especially the security advantages and deterrent factor. It simply makes a productivity comparison of ST's novelty-game and multi-deck round-to-round shuffler to Shuffle Master's *i-Deal* and *MD3*, evaluating how each shuffler fares against the essential time-and-motion challenges.

To recap some of the advantages of ST's shufflers:

* Opening new games is faster.

* Re-starting dead games is faster.

* Changing decks is faster.

* ST's shufflers are optimally positioned to maximize productivity.

* ST's shufflers offer ergonomic designs.

* Simplicity of design results in fewer malfunctions and component failures.

* Clearing jams is faster.

* ST's shufflers allow the most efficient dealing procedures, eliminating costly, ineffective procedures and countermeasures.

* ST's shufflers offer more efficient options for dealing short-handed games.

To evaluate the productivity advantages by utilizing ST's shufflers, estimate the gains by opening new games faster; re-starting dead games faster; changing decks faster; optimal shuffler positioning; ergonomic-design considerations; simplicity of design, which leads to fewer malfunctions and jams, as well as faster recoveries; and the elimination of time-consuming procedures and ineffective countermeasures. After careful analysis, the aggregate advantages begin to hit home and lead to only one conclusion: ST's novelty-game shuffler and round to round multi-deck shuffler supercede and outperform Shuffle Master's *i-Deal* and *MD3* across the board. In fact, Shuffle Master's shuffling methodologies may soon be considered obsolete when compared to ST's shufflers and their many attributes, which will finally empower operators with a unique opportunity to deal the safest and most productive games in the history of gaming!

A NOTE ABOUT CARD COSTS

In addition to the unparalleled productivity benefits, ST's shufflers also offer significant savings in card costs—especially ST's no-batch shufflers.

Multi-Deck Games

Huge savings in card costs are immediately realized in multi-deck games where the decks are traditionally changed once per shift. Here's an example. Assume a club with 30 six-deck blackjack games running on swing shift. It takes 360 decks to open and operate these games with the *MD3* (30 tables x 12 decks). ST's round-to-round multi-deck shuffler (no-batch shuffler) *only requires six decks per game so a 50% reduction in card costs is immediately realized* (30 tables x 6 decks = 180 decks). At $1 per deck, this is a savings of $180 per shift. When these savings are projected annually, it's substantial, and the savings is even higher for baccarat due to the eight-deck format.

Normal Wear and Tear

ST's Detection System can also monitor normal wear and tear, identifying many situations where the life of the card can be extended dramatically. When the decks are changed according to a schedule (tradition), a deck subject to constant player/dealer handling is viewed no differently than a deck in new-deck condition sitting on a dead game. ST views these philosophies as outdated. When decks are changed based on science and not tradition—utilizing sophisticated, proprietary algorithms that track thickness, flatness, containment buildup, and other metrics—they can safely remain in play longer, providing another way to reduce card costs.

ST's shufflers will soon include a small, unintrusive LED on the back that shows green or red. If the LED shows red when it's "time" to change decks, the decks can be changed according to schedule—indicating moderate or excessive wear and tear. If the LED shows green, however, Shark Trap is informing management that there's no scientifically valid reason to change decks—indicating that the decks are still in excellent condition. This feature will prove particularly valuable in games where the public handles the cards and the decks are changed frequently.

In summary, ST's shufflers were designed to realize the maximum value of every deck of cards. The shufflers will even allow operators to explore alternative, less expensive cards from smaller and yet-to-be established makers, yielding yet another way to reduce card costs. And most importantly, operators can adopt these long-overdue guidelines and fresh philosophies while reaping the benefits of ST's proprietary technology with complete confidence that the system will tirelessly monitor, analyze, and protect their playing cards!