

THE AMAZINGLY SIMPLE WAY  
TO OFFER BOWLING



A collection of white papers  
and research  
on global string machine trends





String pinspotter adoption is skyrocketing in the USA and all over the world, rapidly improving bowling operations and greatly expanding the reach of the sport. In 2019 QubicaAMF introduced the EDGE String pinspotter—the newest, most advanced string machine ever. Today EDGE String is uniquely helping operators and new investors deliver authentic sport bowling and exciting entertainment bowling that's easier, more efficient, more profitable and more sustainable.

In this document you will learn more about string machine trends and how EDGE String can help your business.

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## The String Machine Game Changer

Installment 1 of 3

Brought to you by QubicaAMF

# Game-Changer: String Machine Adoption in the Bowling Industry

*When most people go out for a night of bowling fun they don't think about how the pins are picked up and put down. But the modern sport of bowling would be far different (and far less enjoyable) if not for essential pieces of equipment, known as pinspotting machinery.*

### **Pinspotting Machines Enabled the Growth of Bowling**

Pinspotting machines have been a centerpiece of bowling entertainment for over seven decades. The first automatic pinspotter was introduced in 1946 and considered game-changing technology at the time. It streamlined the laborious task of spotting bowling pins which, until then, had been done manually by "pin boys." It would not be an exaggeration to say that the advent of automatic pinspotting machines was a key driver for bowling's meteoric rise in the decades that followed.

**Back in the day:  
Until about 1946,  
bowling pins were  
set and reset manually  
by "pin boys."**

# Types of Pinstotting Machines

Fast-forward to today and you'll find two types of pinstotting machines in use in bowling centers around the world: free-fall and string machines.



## Free-Fall Machines

Free-fall machines derive their name from the fact that the bowling pins are not attached to anything as they go through the pinstotting process. As they sit untied on the pin deck, a combination of mechanical fingers and cups pick them up and re-spot them. The first automatic pinstotter was a free-fall machine, and this is still the most prevalent type in use today.

### QubicaAMF Free-Fall Pinstotter

- 1946** AMF introduces the world's first automatic pinstotter
- 1952** AMF puts the 82-30 model automatic pinstotter into full production
- 1963** AMF introduces the 82-70 model pinstotter
- 1991** AMF introduces the 82-90 pinstotter
- 1996** AMF introduces the 8800 Gold pinstotter
- 2005** AMF and Qubica merge. Together, they unveil the first intelligent pinstotter, the 90XLi
- 2012** QubicaAMF introduces the XLi EDGE pinstotter, the most reliable pinstotter ever



## String Machines

Invented in the mid-60s, string machines lift and re-spot pins by connecting them to a drive mechanism using cords. String machines have fewer parts, require fewer adjustments, and demand less maintenance than their free-fall counterparts.

### QubicaAMF String Pinstotter Timeline

- 1973** Mendes, QubicaAMF's predecessor, introduces the Mendes String Pinstotter for duckpin and five-pin bowling
- 1990** Mendes introduces the venerable ME-90, which quickly becomes one of the most successful string pinstotters
- 2002** Qubica acquires Mendes and introduces the TMS string pinstotter for tenpin bowling
- 2008** QubicaAMF enhances the TMS string pinstotter with an easier-to-use control system
- 2019** QubicaAMF introduces the EDGE String pinstotter, the world's most innovative string pinstotter

Invented in the mid-60s,  
string machines lift and re-spot pins by connecting them  
to a drive mechanism using cords.

# The String Machine Trend

Despite having been around for over five decades—and being less complex and expensive to operate than free-fall, string machines were, prior to 2015, mostly used in niche bowling applications such as:

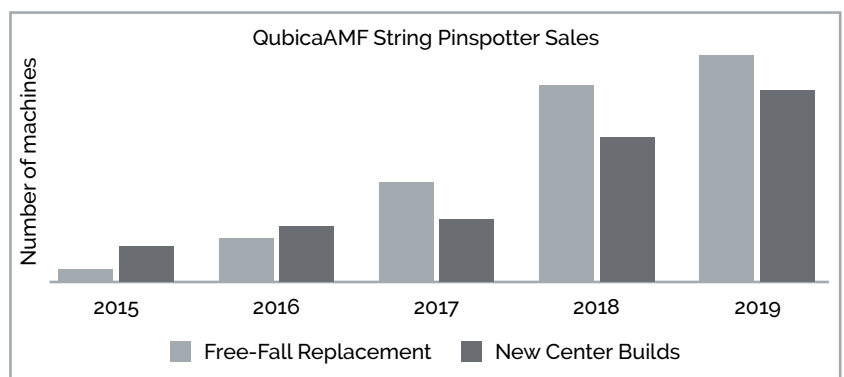
- Five-pin and duckpin bowling formats in Canada
- Tenpin bowling in a few European countries
- Mini-bowling games like QubicaAMF's Highway66

Over the past decade, however, the bowling industry has undergone some changes that play into the strengths of string machines and now they are better positioned than ever to become more mainstream.

**Once dismissed, string machines are better positioned than ever to become mainstream.**

Around 2015 the bowling world began to look at string machines differently. Suddenly, new bowling entertainment investors started choosing string machines instead of free-fall. In fact, since 2017, string machines have been included in over 90% of QubicaAMF's new center investor projects in the United States. 100% of these customers have chosen QubicaAMF string machines for subsequent projects.

More recently, research has shown that older free-fall machines are increasingly being replaced by string machines within existing bowling centers as well. In 2019, nearly 70% of the QubicaAMF pinspotters sold to existing bowling centers were string machines that replaced existing free-fall.



**In 2019, nearly 70% of the QubicaAMF pinspotters sold to existing bowling centers were string machines that replaced existing free-fall.**

# What's Driving the String Machine Trend?

String machine adoption has never been greater than it is right now. What's driving the trend? What's changed that makes them more attractive to existing center operators and new center investors?

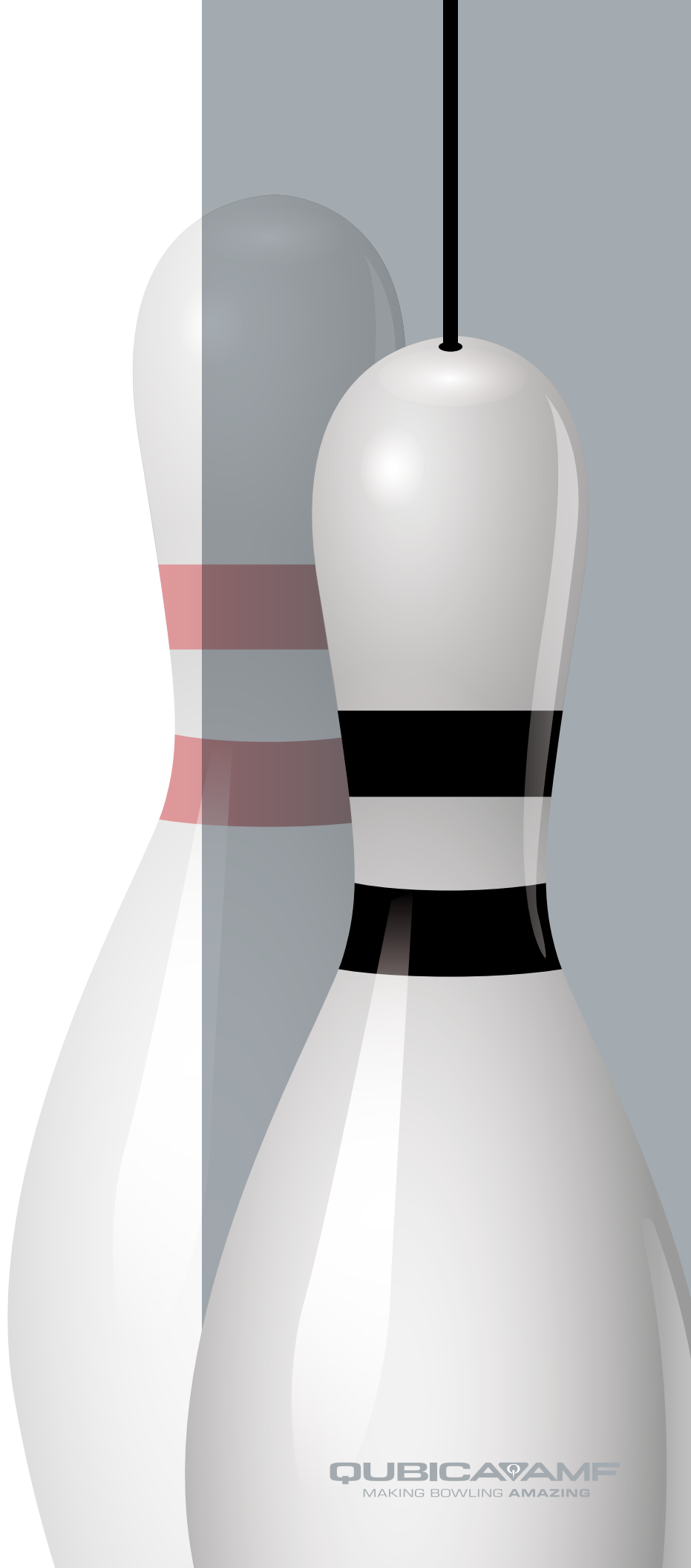
There are three primary drivers:

- Operational challenges with free-fall machines
- A transition to entertainment-focused bowling
- Increased bowler acceptance

## Operational challenges with free-fall machines

In 1946, the automatic free-fall pinspotter was the engine that enabled bowling to explode in popularity. However, in 2020 studies show that free-fall machines present bowling centers with some of their biggest challenges:

- **Finding Experienced Technicians**  
Free-fall machines—old and new—are complex and require skilled technicians to maintain them. It has become extremely hard to fill these positions, and the problem is getting worse as older technicians retire. Many younger people don't have an interest in becoming bowling technicians, and thus are not stepping in to fill the ranks.
- **Delivering a Great On-Lane Bowling Experience**  
Today's centers must provide the best on-lane bowling experience possible



to continue earning the consumer's entertainment dollar. The shortage of bowling technicians has many centers struggling to keep their free-fall machines running reliably to deliver on this. For others, as their technicians retire, it's just a matter of time before this becomes a problem.

- **Operational Costs**

Operational costs for free-fall machines are one of the biggest challenges centers face today. Labor, parts and electricity costs that centers spend on their free-fall machines are typically between \$2.5K and \$4.5K per lane per year, and as high as \$6K in some cases. These costs vary based on things like center size, lineage, machine type and age, technician experience level and business model. Maintaining free-fall machines typically costs significantly more than other bowling center attractions, such as arcades, laser tag, or the restaurant and bar.

## **A transition to entertainment-focused bowling**

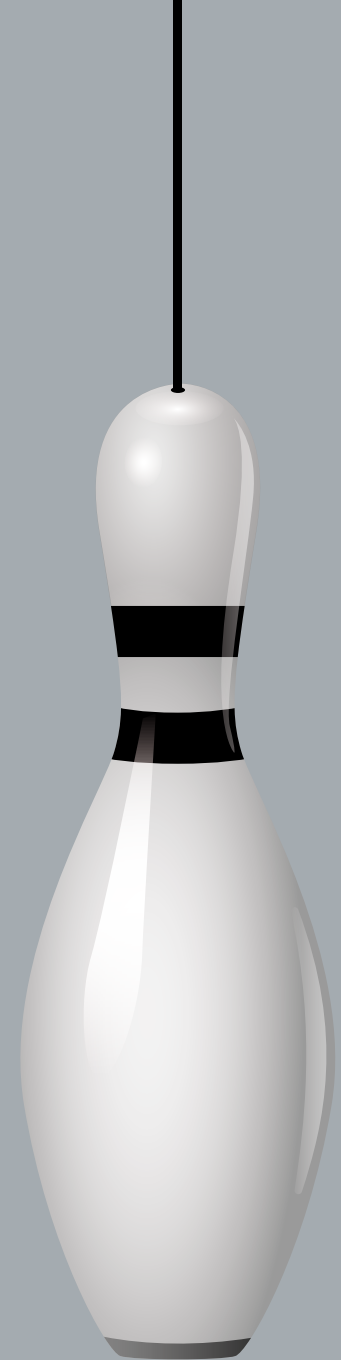
Bowling has shifted from an activity once dominated by sport leagues to an activity in which entertainment and the casual bowler are a key focus—making string machines a viable option existing operators and investors building new centers.

## **Increased bowler acceptance**

Bowling centers operating string machines have reported many times over that the majority of their casual bowlers don't realize when they are bowling on a string machine, and of the ones that do realize, most are very happy with the experience.

Additionally, many existing centers with sport leagues that replaced free-fall machines with string machines have reported acceptance from their sport league bowlers to be high after the switch.

Considering these challenges, it's easy to see why string machines are an effective solution. Their simplicity makes it easier to find people to maintain them, easier to keep them running reliably for a smooth guest experience; and their operational costs are a fraction of free-fall machines. Moreover, acceptance by both casual and sport league bowlers is generally very good.



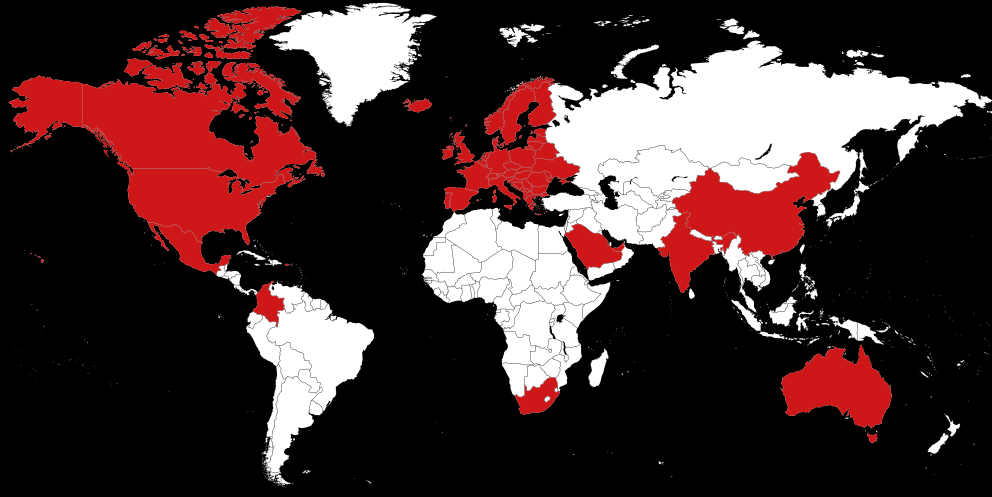
## **String Machine Benefits:**

- Easier to operate and maintain
- More reliable for better guest experience
- Lower operating costs



# String Machine Adoption is Spanning the Globe

QubicaAMF has seen over 800% growth globally in string pinspotter shipments since 2015. The map below shows the countries with the greatest rates of string machine adoption.



## Across the globe some of the world's largest bowling operators are adopting string machines

**Bowlero Corporation**, the largest bowling operator in the world, with over 300 centers and 12,000 lanes, chose QubicaAMF string pinspotters for their last 3 new center builds, totaling 101 lanes.

**Hollywood Bowl**, the largest bowling operator in the U.K., with over 60 centers and over 1,400 lanes, is using QubicaAMF string pinspotters for their new center builds. Additionally, they are replacing free-fall machines within some existing centers with QubicaAMF string pinspotters.

**Tenpin**, the second largest bowling operator in the U.K., with over 40 bowling centers and 1,100 lanes, is replacing their free-fall machines with QubicaAMF string pinspotters. To date they have replaced over 800 of their 1,100+ lanes of free-fall machines.

**TEEG**, Australia's largest bowling operator, with over 45 centers and over 1,000 lanes, is using QubicaAMF string pinspotters for their new center builds. Additionally, they have they have replaced free-fall machines in 9 centers totaling 202 lanes with QubicaAMF string pinspotters.

## What Increased String Adoption Means for the Industry

Over the past 50 years string machines have emerged from the sidelines to become a very viable and popular mainstream technology—one that's transforming the industry and expanding the reach of bowling. String pinspotters have proven themselves to be good for all types of bowling applications - from niche applications like five-pin and mini-bowling games to mainstream tenpin bowling and reinvented formats like duckpin bowling.

With their inherent simplicity and reliability, they have been well accepted by casual and league bowlers alike. Just as important, because of their proven operational benefits they have been embraced by bowling center owners and operators as well who, because of these machines, are realizing unprecedented growth and profitability.

## The String Machine Game-Changer

Installment 2 of 3

Brought to you by QubicaAMF



## Game-Changer: The Business Case for String Machines

String machine adoption has never been greater - and for good reason: compared to free-fall machines they are easier, more reliable and less costly to operate. In our first installment of this series we looked at the major bowling industry trends driving string machine adoption. One involved the challenges with older free-fall machines, which include difficulties in finding qualified technicians, reliability, operational costs, and delivering a great on-lane experience.

### In this installment we will:

- Take a more in-depth look at the operational costs of free-fall versus string machines
- Make a strong business case for switching from older free-fall machines to strings; and
- Discuss what this means for new and existing proprietors and the game of bowling overall



## Top 3 Reasons Owners Prefer String Machines

## Introduction

In 1946, the automatic free-fall pinspotter was the engine that enabled bowling to grow and explode in popularity. However, the situation in 2020 is much different. In fact, our studies show that older free-fall machines burden bowling-based businesses and new investors with some of their biggest operational expenses. Labor, parts and electricity costs can run between \$2.5 and \$4.5 thousand per lane per year—and as high as \$6 thousand in some cases.

**Operational costs for free-fall machines can approach \$6 thousand/lane/year. String machines cost a fraction of that.**

The operational costs of string machines are a fraction of that. What's more, they also cost less to purchase and install. According to a poll conducted by the publication Bowling Center Management in September 2020, proprietors chose string machines for three main reasons: personnel savings; maintenance savings; and lower up-front costs<sup>1</sup>.

**BCM POLLED** a number of operators who utilize string pinsetting machines at their centers. Here are the top three reasons they selected strings over free-fall machines:

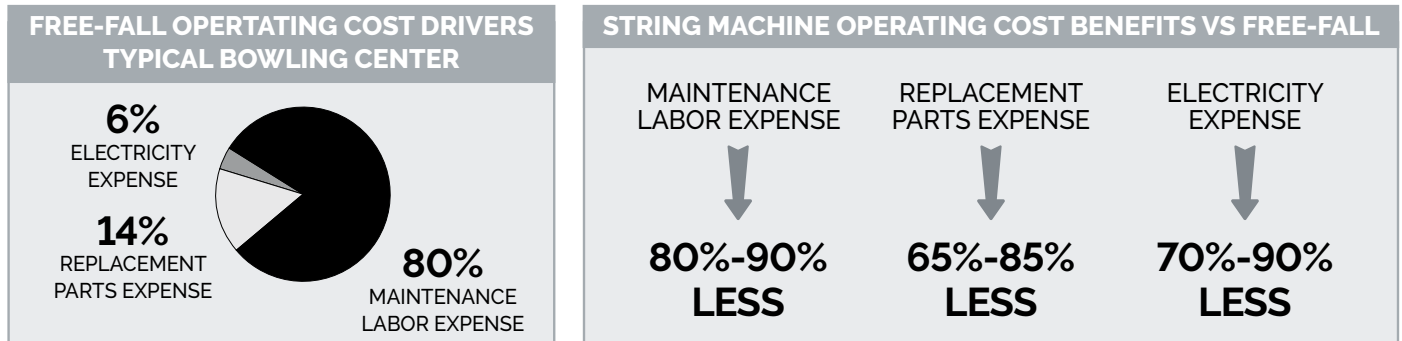
- 1. Personnel savings.** There is no need for a full-time mechanic or mechanics. Machine upkeep can be handled by an arcade game technician or someone with similar skills.
- 2. Maintenance savings.** String machines require far fewer spare parts to buy and stock.
- 3. Up-front cost.** String machines cost less than free-fall machines, making it easier to deal with lending institutions and/or purchase more machines.

<sup>1</sup>"Strings in the Spotlight", Bowling Center Management Survey, September 2020

If you layer-on COVID-19's continuing impact, the operational cost benefits of string machines can make a bigger difference than ever to help centers reduce financial stress and recover faster post-pandemic.

# Pinspotting Machine Operational Cost Drivers

The operational costs for pinspotting machines consist of five primary components: maintenance labor expense; replacement parts expense; electricity expense; working capital; and technician hiring and training expense. In all of these areas our studies show string machines prove to be significantly less – especially in ongoing maintenance, parts and electricity expenses.



## Maintenance Labor Expenses

These are the labor costs needed to keep pinspotting machines running reliably and consist of:

- a) the labor time associated with operating and maintaining pinspotting machines; this includes time spent on routine maintenance and addressing day-to-day needs
- b) the labor cost of the technicians

QubicaAMF research indicates that maintenance labor expenses are by far the largest operating cost driver for a typical bowling center. However, we've found that replacing free-fall with string machines can result in an 80-90% reduction in maintenance labor expense.

Here's another labor-related benefit of switching to string machines. Centers struggling to employ qualified technicians can ease their recruitment efforts and completely eliminate pinspotting maintenance labor costs per se. Conversely, centers lucky enough to employ talented technicians can retain them and still realize significant labor cost savings. How? By reassigning them to duties that eliminate other business costs, and which add also value to the center.

### Case in Point: Dover Bowl

This 22-lane center has an excellent head technician, but struggled to find and keep good help for him. Consequently, he was tied to the pinspotting machines, unable to support other areas of the business. By switching to string machines the center freed the technician to cover all aspects of facility maintenance, saving the cost of hiring outside contractors.

## Replacement Parts Expenses

Addressing normal wear and tear, plus broken or damaged components, is typically the second largest operating cost driver with variances depending on:

- a) the type, age and overall condition of the pinspotting machines
- b) the robustness of the center's maintenance program; and
- c) the experience level of the technicians

Our research suggests that replacement parts expenses account for some 14% of total free-fall machine operational costs for a typical bowling center. Here at QubicaAMF, we typically see centers spending between \$350 and \$700 per lane per year on older free-fall machines, and as high as \$900 in some cases.

Because string machines have significantly fewer parts overall—and fewer moving parts to wear, replacement parts expenses are typically 65% to 85% less than that of free-fall machines.

### Case in Point: Strike 10 Bowling and Sports Lounge

Located in Hallandale Beach, Florida, this bowling operation reported saving over \$800 per lane per year in replacement parts on average since switching to string machines.

## Electricity Expense

The amount of electricity consumed by pinspotting machines can swing widely based on:

- the model
- age of the machine
- condition of the machine

Free-fall machines use more power because they often have more and bigger motors - and these motors and electronics are less efficient on older free-fall machines.

**String machines consume between 70% and 90% less power than their free-fall counterparts.**

Our research shows that pinspotting electrical expenses are about 6% of the total free-fall machine operational cost for a typical bowling center. These percentages can

multiply two or even three times in places like Germany, Denmark, the Netherlands and Italy as example, which pay an average of between \$0.28 and \$0.39 per kilowatt-hour compared to the U.S national average of \$0.13.

String machines consume between 70% and 90% less power than their free-fall counterparts. This not only reduces operational costs; it also serves as a more environmentally sustainable solution.

### Case in Point: Tenpin Ltd.

The second largest bowling operator in the U.K., has seen an average of a 20% reduction in electricity expenses for their centers that have switched to string machines.

## Working Capital Expense

This includes the amount of cash tied up in pinspotter replacement parts that are sitting on the shelf. Therefore, these funds are unavailable for the center to invest in things that could produce more meaningful returns.

A typical center with older free-fall machines tends to have between \$600-\$1 thousand per lane in spare parts inventory. As shown in the photos below, string pinspotters have far fewer parts; hence they negate keeping many

replacement parts on hand. This frees more working capital.

### Case in Point: Lake Wylie Bowl N' Bounce

"I had a huge room full of spare parts tying up valuable cash," declares owner Darrin Skinner. After switching to string machines, "Now my spare parts fit on one shelf."



Typical free-fall machine spare parts inventory



Typical string machine spare parts inventory & maintenance area

## Technician Hiring and Training Expense

Older free-fall machines are complex. Therefore, hiring qualified technicians can be a major expense—anywhere between \$2.5 thousand and \$4 thousand per employee, particularly for centers that struggle with high turnover. Additionally, it can take eight to 12 months to get new technicians competent with older free-fall machines like A-2 and 82-70s.

**String machines can save centers thousands in technician hiring and training costs.**

By comparison, even a non-technically skilled employee can be trained to comfortably operate a string machine in a matter of a few weeks or less.

# Operational Cost Savings Increase Centers Profitability

Based on our experience with many string machine customers, we've seen over and over that centers switching to string realize significant operational cost savings - \$2.75 thousand to \$4 thousand per lane per year, and as high as \$5 thousand in some cases - leading to increased profitability. Customer success stories also bear this out:

With free-fall pinspotters contributing over 50% to their total maintenance costs, Lake Wylie Bowl 'N Bounce, a 16-lane center in North Carolina, added over \$45 thousand per year to bottom-line profitability by switching to string machines.

According to an article published in the December 2020 issue of International Bowling Industry magazine, Pinz, a 20-lane center in Massachusetts, improved profitability

by \$70 thousand per year after replacing free-fall with string machines—saving about \$6 thousand per month in labor, replacement parts and electrical expenses<sup>2</sup>.

The Tenpin chain in the U.K., with 45 centers and over 1,100 lanes, has replaced 750 of those lanes with string machines and has seen profitability in those centers soar.

This thriving bowling operator is saving on average \$4,884 per lane per year across its string centers as a result of:

- A 22% decrease in maintenance labor expenses
- A 75% decrease in replacement parts expenses
- A 20% decrease in electricity expenses

**Centers are Seeing Increasing Profitability after Converting to String**

Bowl 'N Bounce  
North Carolina  
**+ \$2.8K**  
per lane/per year

Pinz  
Massachusetts  
**+ \$3.5K**  
per lane/per year

Tenpin  
U.K.  
**+ \$4.8K**  
per lane/per year

## Better Guest Experience, Happier Employees, Great for Business

Operational cost savings and increased profitability are not the only benefits string machines deliver. QubicaAMF has repeatedly seen centers switching to string machines report an increase in guest satisfaction and also happier employees. Happier guests drive repeat business and more revenue; while happier employees mean less turnover, consequently lower hiring- and training-related expenses.

Realizing social media's impact on business, consider Woodlawn Bowl in Ontario, Canada. After changing to string machines their guest experience and social scores both rose dramatically. "In the first six months our rating increased from 3.4 to 4.5 out of five stars," says owner Bob McKay.

**Woodlawn Bowl's social media review ratings increased from 3.4 to 4.5 out of 5 stars after installing string machines.**

Tenpin Ltd.'s Graham Blackwell was equally enthusiastic. "String machines have been a huge win for our guests, our employees and our business," he states after witnessing a 5% revenue increase in centers that switched to string machines. Tenpin also reported a 250% improvement in games bowled without a machine stop, plus 63% fewer guest refunds. Moreover, their employees reported being happier amid a less stressful environment, thanks to fewer pinspotting machine problems and upset guests.

**Tenpin has had a 250% improvement in games bowled without a machine stop across its centers with string machines.**

# A Low-Risk Investment

Few investments are a sure bet. However, an investment in string machines is virtually a guaranteed win.

String machines lower operating costs by an amount that can be accurately measured because it is based on known quantities: operating costs for the string machine plus the center's current operating costs. This in contrast to other types of investments where returns are heavily dependent on growing the customer base and topline revenue. Both of these are hard to predict and act upon.

**Because operational costs savings can often exceed loan payments on new string pinspotters, a center can essentially replace older freefall machines for free.**

But the business case gets even better. Often, a center can essentially replace older free-fall with string machines for free. As David Breen, owner of Pinz, discovered, this is because the resulting monthly operational cost savings can exceed the loan on the machines<sup>2</sup>.

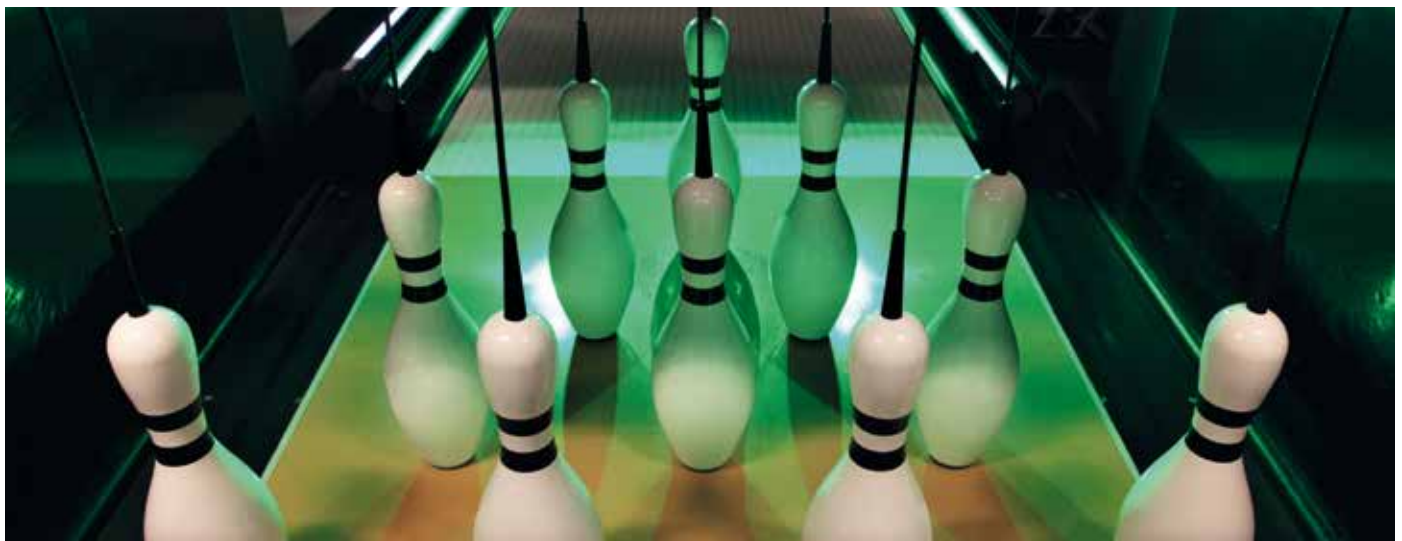
## Case in Point: Pinz

Pinz replaced 20 lanes of free-fall with string and the operational cost savings is paying for the cost of the string machines<sup>2</sup>.

## The Business Advantage of String Machines: What It Means for the Game

The fact that string machines can make bowling centers more efficient and profitable is undeniable. What's more, because they improve pinspotter reliability they also help centers deliver a better guest experience. Spread across the industry, this contributes to healthier bowling businesses overall, ensuring a reliable, long-term attraction for sport bowling and players of all kinds.

On top of this, string machines make it easier for new investors to bring the fun and competitive challenge of bowling to new parts of the world, expanding the sport's reach and growing the game. This is because string machines are less expensive to purchase and install, easier to operate, and more environmentally friendly than free-fall machines.



<sup>1</sup>"Strings in the Spotlight", Bowling Center Management Survey, September 2020

<sup>2</sup>Groh, Fred. "The Next Big Thing", International Bowling Industry, December 2020

## The String Machine Game-Changer

Installment 3 of 3

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# String Machines and Sport Bowling

### Executive Summary:

The use of string machines is stretching beyond recreational bowling applications and into the competitive side of the sport, as seen by certifications from many highly respected governing bodies. Yet, despite qualitative and quantitative research showing the many benefits of string machines, some skepticism lingers. Nevertheless, a groundswell of string bowling acceptance bodes well for the future of the sport in general.

### In this installment we will:

- Discuss the progression of global string machine certification for sport bowling
- Reveal quantitative and qualitative studies on the practical differences between string and free-fall pinspotters
- Expound on what the future might hold for universal string machine adoption, and its impact on bowling in general



# Beyond Recreational Bowling

Since their invention in the early 1960s, string pinspotting machines have been primarily used in niche entertainment bowling applications such as five-pin, nine-pin, duckpin and mini-bowling games. In recent years, however, their use in tenpin has grown significantly as existing and new investors realize their operational advantages.

While the use of string machines for tenpin has been mainly confined to entertainment bowling, we are now seeing their growing acceptance for sport bowling. Why? The reason is simple:

Centers that offer sport bowling struggle with the same pinspotting operational costs and issues as recreational centers, while advancements in string machine technology have made them better than ever for sport bowling.

## String Pinspotter Benefits:

- Reduced maintenance
- Lower operating costs
- Decreased energy consumption
- Less stress for owners and staff
- A better bowling experience for players



Canadian Tenpin Federation



British Tenpin Bowling Association



Tenpin Bowling Australia



Fédération Française de Bowling et de Sports de Quilles



Austrian Bowling and Skittles Association



Norges Bowlingforbund

## Early Approval of String Machines for Sport Bowling

Bowling has always been immensely popular, both as a recreational activity and a sport. Today 114 countries have a bowling federation responsible for establishing and enforcing the rules of play.

Canada was the first country to allow string machines for sport bowling. After completing a year-long pilot program, the Canadian Tenpin Federation (CTF) approved string machines for sport bowling in June of 2017. "It was not a question of if string machines should be allowed for sport bowling, but when?" Dave Kist, president of the Canadian Tenpin Federation was quoted as saying<sup>1</sup>.

**In June of 2017, Canada was the first country in the world to allow string machines for sport bowling.**

A year later, in 2018, the British Tenpin Bowling Association (BTBA) approved string machines for competitive use. "In the UK, bowling centers are struggling to remain open with their current overheads," said BTBA chairperson Lisa John. "If switching to string machines allows them to keep their doors open, we have to embrace it<sup>1</sup>."

Soon after the BTBA decision, Tenpin Bowling Australia (TBA) announced approval of string machines for sport

bowling. "It was fairly clear a number of years ago that string machines were going to be the way of the future. They are safer, more economical to run, and require significantly less maintenance. In Australia there are increasing challenges in finding mechanics that can maintain free-fall machines." Cara Honeychurch, TBA's former CEO<sup>1</sup>.

### Pivotal IBF Certification

Hearing of the positive experiences the CTF, BTBA and TBA had with string machine adoption, the International Bowling Federation (IBF)—the governing body for 114 federations and the sport of bowling—went a step further:

In November of 2020, they approved string machines for sport leagues and tournament play, including all IBF-sanctioned events. The IBF also extended support to all its member federations to do the same in their respective countries.



**"Now, operators and investors who choose string machines as a way to make their businesses more efficient, profitable and sustainable can continue to offer sport bowling." – Andrew Oram, IBF CEO**

<sup>1</sup> "Bowling on a String", International Bowling Industry, January 2021

Andrew Oram, IBF's CEO said, "Our approval of string machines for sport bowling ensures bowling operators and investors have real choices in new technology. Now, operators and investors who choose string machines as a way to make their businesses more efficient, profitable and sustainable can continue to offer sport bowling."

### A Ripple Effect Felt Around the World

Since the IBF's announcement, bowling federations worldwide are following their lead:

- The United States Bowling Congress (USBC) announced it is researching string machines with plans to publish a complete report in 2022 or earlier

- Federations in France (the Fédération Française de Bowling et de Sports de Quilles) and Austria (the Austrian Bowling and Skittles Association) approved string machines for sport bowling
- String machine approval is a hot topic in many other bowling federations around the world

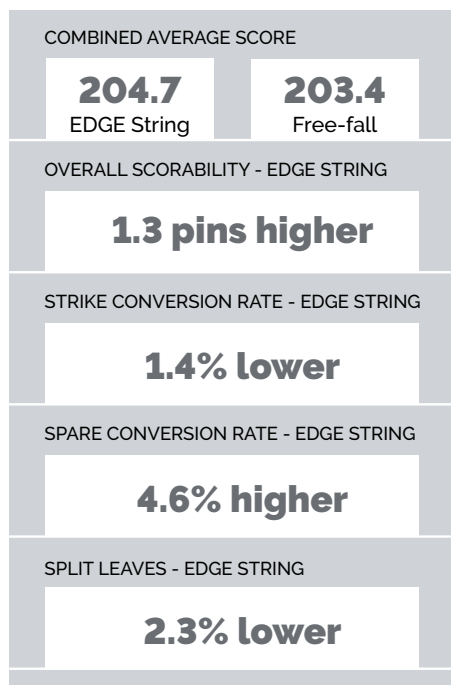
Given the IBF decision, it seems string machines may become mainstream over the coming years. As with previous bowling innovations—such as synthetic lanes and reactive balls, the benefits of string machine technology are too significant not to be accepted for the sport.

## Research Studies: String Machine Play Versus Free-fall

Despite growing acceptance of string machines for sport bowling, many in the industry may be skeptical. To address this, in July of 2020 QubicaAMF conducted a research study on the scoring and pinfall behavior of its EDGE String pinspotter compared to free-fall machines.

We recruited a total of 65 PBA, league, and avid bowlers to participate to the study, with a combined average of 222 and 20-years competitive experience. Each participant bowled an equal number of games on free-fall machines and EDGE String pinspotters, respectively.

After over 600 games, our study showed that, while some differences in pinfall and pin action exist between the two systems, overall scoring performance on EDGE String was very close to that of free-fall machines.



### QubicaAMF Research Study: Findings

The **combined average score** on EDGE String was 204.7 versus 203.4 for free-fall

**Overall score-ability** between EDGE String and free-fall was very close: just 1.3 pins higher

The **strike conversion rate** on EDGE String was 1.4% lower than free-fall

The **spare conversion rate** on EDGE String was 4.6% higher than free-fall

There were 2.3% fewer **split leave situations** on EDGE String

The **split conversion rate** on EDGE String was 8% higher than on free-fall



## Participant Feedback:

Here are some of the most common observations from bowlers in the study:

- **Solid-pocket hits** on EDGE String yield strikes much as they do on free-fall machines, light and half-pocket hits less so
- **Spares and splits** appear a bit easier to pick up on EDGE String
- EDGE String **pins are consistently on-spot**; there are no “bad racks”
- With EDGE String there is **no deadwood** to slow the pace of play



Read the full QubicaAMF research study on scoring and pinfall behavior of EDGE String compared to free-fall.

As part of the study, pinfall on EDGE String was recorded under different pin-leave situations.



Watch the EDGE String Pin Action Video

Another study on free-fall play and scoring compared to string was conducted in the fall of 2018 by the Middlesex County Association of the British Tenpin Bowling Association (BTBA). It was conducted at Airport Bowl in London, England. Airport Bowl, one of the busiest sport league bowling centers in England, replaced their fee-fall machines with string machines in 2018. The study consisted of 108 league bowlers with a combined average on free-fall of just under 166. After bowling a total of 432 games on string, the combined averages were a fraction over 169 – about 3 pins difference with free-fall.

As mentioned, the USBC is in the process of conducting research on string machines and have promised a complete report in 2022. However, in January 2021 they released some preliminary findings. These findings represent the combined performance of multiple manufacturer's string machines tested in a lab environment using a ball-thrower. USBC reported average strike percentages down a combined 6.9% across all ball entry angles tested, with the largest decrease occurring on light-pocket hits. A lower strike conversion rate driven by light pocket hits is consistent with the findings of the QubicaAMF study. For more information and the preliminary USBC report visit [www.bowl.com](http://www.bowl.com).

# Proprietor and Sport League Bowler Experiences

We are seeing more proprietors with competitive sport bowling and leagues making the switch to string machines.

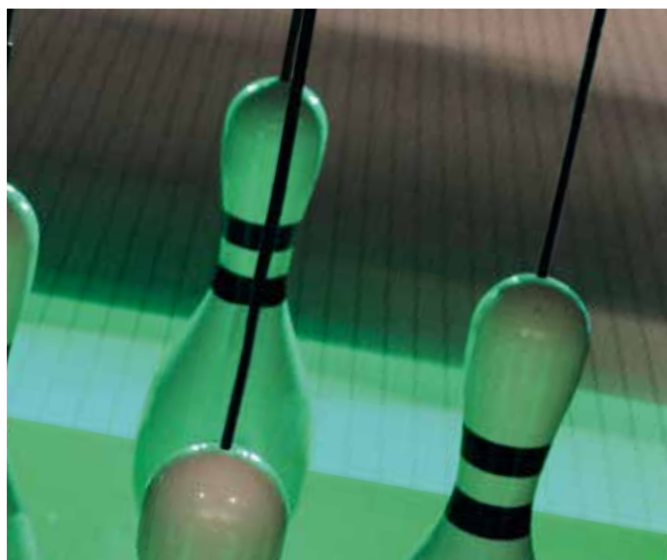
## Mark Bowen, Proprietor Dover Bowl, NH

Consider Dover Bowl, a 22-lane center in Dover, New Hampshire. Owner Mark Bowen made the decision to replace his free-fall pinspotters with strings after years of struggling to keep his machines running reliably. League bowling was suffering.

"We don't have breakdowns anymore," Bowen says. "People are not at the front desk complaining. My staff is much happier. My leagues are much happier, and they finish earlier now. Plus, my life is much less stressful." Mark expects the changeover will grow his league business because the bowling experience is so much better.

## Doug and Becky Bowersox, Proprietors Lewistown Lanes, PA

This 12-lane center constantly fought to keep their old free-fall machines running reliably. Three months after switching to string pinspotters, Becky Bowersox, reported the majority of their league bowlers were very happy with the string machines. "We had some bowlers that were concerned and skeptical. But after bowling on the string machines most have realized it is not so different. They are so happy with the reliability."



**"I was a little leery at first, but...I have been impressed [with string machines] so far."**

**Raymond "Skip" Bryner Jr.**  
USBC Association Mgr.  
for Central Pennsylvania

## Raymond "Skip" Bryner Jr. USBC Association Manager and 221-Average League Bowler

This USBC Association Manager for Central Pennsylvania bowls in USBC leagues at several centers, including Lewistown Lanes. Of the string machines he remarks, "I was a little leery at first, but I said I would be open minded about them and I have been impressed so far."

Raymond believes everyone should try string pinspotters before rendering an opinion; and he also thinks the USBC should sanction them.

## Lew Varner, League Bowler

Lew rolled a 300 game shortly after the string machines were installed at Lewistown Lanes. "My average so far on the string machines is very close to what I bowl on free-fall," he insists. "Just about two pins lower." He simply doesn't see much difference between the two systems, saying, "Just like with free-fall it boils down to how well you throw the ball."

## Richard Finkenbiner, 156-Average League Bowler

Richard states that most of the league bowlers at Lewistown Lanes are thrilled with the string machines. As for himself: "My scores have gone up a little...maybe two or three pins. Occasionally you get a break with the string, but it is not as different as people may think."



## What Will String Machines Mean for The Sport?

The evolution of string machines from tenpin recreational bowling to sport bowling is natural. And the operational benefits of string machines are clear: lower maintenance, operating costs, and energy consumption; less stress for owners and their staff; and a better bowling experience for consumers.

It is also clear that bowler averages and scoreability on both string and free-fall machines are close and the gameplay for each remains one of skill. Bowlers may need to adjust their technique slightly when playing on string machines. Yet, this is not unlike what they would do for differing lane conditions, balls and pins.

## Good News for Proprietors, and the World

Worldwide acceptance of string machines by the sport's governing bodies is mounting. More and more proprietors are choosing string machines for both recreational and sport bowling. Proprietors with string machines have reported being able to preserve and grow their competitive league business. In end, this can only be good for bowling as a whole, making the sport more sustainable, more environmentally friendly, and likely to continue spreading around the globe.

**QubicaAMF Research Study:  
Scoring and Pinfall Behavior of  
EDGE String Compared  
to Free-Fall Machines**







# Scoring and Pinfall Behavior: EDGE String versus Free-Fall

## Background

Since the mid-1960's string pinspotting machines have been used for entertainment bowling applications such as five-pin, nine-pin, duckpin and mini-bowling games. More recently string machines are increasingly being used for tenpin bowling — as existing and new bowling investors are drawn to their operational benefits such as reduced maintenance, lower operating costs, decreased energy consumption and less stress for owners and staff.

When we decided to develop the EDGE String pinspotter the product requirements included features to make the play as similar to free-fall machines as possible to deliver the most authentic experience possible for both recreational and competitive sport league bowling. Consequently, EDGE String was designed to meet the relevant dimensions controlled by USBC for certified free-fall machines—these include kickback spacing, ball stop location, pin curtain location and pin deck surface-to-pit floor surface distance. EDGE String was given a unique string handling system to minimize resistance strings can have on pinfall, so pins fall over easily - as close to free-fall as possible.

Lastly, the sport bowling environment is rough on equipment so EDGE String was designed to be uniquely robust — using premium material such as thick hardwood kickbacks, a heavy-duty ball stop, state of the art industrial gearmotors and long-life bearings in the drive train.

### EDGE String Designed for the Sport

- Meets relevant dimensions controlled by USBC for free-fall machines
- Unique string management so pins fall over easily — as close to free-fall as possible
- Uniquely robust to perform and last for decades of rigorous sport bowling

In creating EDGE String our hypothesis was the bowling experience, pinfall and overall scoring would be very close to that of free-fall. To test this hypothesis we deigned and executed a research study on the scoring and pinfall behavior of EDGE String compared to free-fall machines.



## Purpose

Prior to this study no comprehensive side-by-side research between string and free-fall machines had been conducted and little qualitative data existed on how play and scorability compares to free-fall pinspotting machines.

The purpose of this research was to collect real-world quantitative scorability data and qualitative feedback on how EDGE String performs as compared to traditional free-fall machines under sport bowling conditions.

The study was conducted with experienced sport league and elite bowlers—real bowlers under real-world bowling conditions.

Specifically, QubicaAMF collected data to understand the following:

- How the pinfall and pin action on EDGE String compares to free-fall
- How overall scorability on EDGE String compares with free-fall
- How sport league and elite bowlers view the competitive experience on EDGE String versus free-fall

## Structure

The study was conducted in a real-world tournament format<sup>1</sup> using a combination of experienced sport league bowlers and elite professional bowlers.

A bowler rotation process ensured each bowler played an equal number of games between QubicaAMF EDGE String machines and free-fall machines. All controllable variables were kept the same, only changing the pinspotting machine between EDGE String and free-fall. Scoring data was collected through the tournament management system within Conqueror X. Additionally, a brief written survey of participants was conducted, along with interviews of a subset of participants.



<sup>1</sup> QubicaAMF "Some Strings Attached" tournament, July 25-26, 2020, HeadPinz Entertainment Center, Naples, FL, USA.

## The structure of the study was as follows:

Location	HeadPinz in Naples, Florida
Dates	July 25 and July 26, 2020
Number of Participants	65 Bowlers
Combined Participant Average Bowling Experience	20 Years
Combined Participant Bowling Average	222
String Machine Used	QubicaAMF EDGE String
Free-Fall Machine Used	Brunswick A2
Number of Lanes	8 Lanes of EDGE String, 8 Lanes of free-fall
Bowling Lane Surface	QubicaAMF SPL Select
Pins Used	QubicaAMF AMFlite Glow Pins
Scoring and Management System Used	QubicaAMF BES X and Conqueror X
Bowling Ball Used	Varied. Participants were allowed to use their own balls





# Results

## Scoring Comparison

After 65 bowlers, with 20 years competitive experience on average, bowled 671 games between EDGE String and free-fall (half of the games were bowled on EDGE String and half on free-fall machines) the overall average score in free-fall was 203.4 and 204.7 on EDGE String. The table below summarizes the scoring between EDGE String and the A2 free-fall machines.

Overall Average Scoring Results	Free-Fall	EDGE String
Pinfall	68,149	68,799
Games Bowled	335	336
<b>Average Score</b>	<b>203.43</b>	<b>204.76</b>

The overall scoring was just 1.3 pins higher on EDGE String.

## Strike, Spare & Split Comparison

In addition to overall scoring, data on the strike, spare and split performance between EDGE String and the A2 free-fall machines was captured. The strike conversion rate on EDGE String was 1.4% lower than free-fall and the spare conversion rate was a 4.6% higher. There were 2.3% fewer split leave situations with EDGE String, however when splits were left the split conversion rate on EDGE String was 8% higher than the A2 free-fall machines. The table below summarizes these results.

Strike, Spare & Split Results	Strikes	Spares	Splits Left	Splits Converted
Free-Fall	1,939	1,139	334	44
EDGE String	1,892	1,311	250	53
Free-Fall Conversion %	52.6 %	30.9%	9.1 %	13.2%
EDGE String Conversion %	51.2 %	35.5 %	6.8 %	21.2%
<b>EDGE String-to-Free Fall Variance</b>	<b>-1.4 %</b>	<b>4.6 %</b>	<b>-2.3 %</b>	<b>8.0 %</b>

## Participant Feedback

Qualitative feedback from the bowlers on pinfall and pin action behavior between EDGE String and free-fall was captured.

Feedback across bowlers interviewed was very consistent, with the most common observations as follows:

- Strikes are a little harder to achieve on EDGE String

Solid pocket hits carry well, rewarded with strikes just like on free-fall

Light pocket and half-pocket hits don't carry as well, so fewer of these resulted in strikes

- Spares and splits are in general a little easier to pick up on EDGE String than on free-fall
- The pins are consistently on-spot, with no "bad racks" as sometimes seen with free-fall machines
- There was no deadwood to slow the pace of play as you sometimes get with free-fall

Additionally, the results of a written survey found 97% of participants would bowl on EDGE String pinspotters in a competitive sport tournament.

## Analysis of Results

The results show differences in pin action and pinfall behavior exist between EDGE String and free-fall, however overall scoring performance between EDGE String and free-fall is very close. In other words, the end result is about the same but the path travelled to get there differs somewhat.

To begin with, the data shows the strike conversion rate on EDGE String is only 1.4% lower than on free-fall. This very small difference is a consequence of the string imparting some resistance on the pin's ability to fall. On EDGE String this gap is so small because, unlike the alternative string machine products on the market, EDGE String's handling system was designed to minimize string resistance to pinfall. Participant observations add more color, indicating it is the "light"

or "weak" pocket hits which drive the strike conversion difference. Lighter hits did not result in strikes as easily on EDGE String as they did on free-fall.

Our research found the spare conversion rate on EDGE String to be 4.6% higher than free-fall. This is a direct result of the pins being attached to strings and those strings sometimes knocking over pins that otherwise may not fall on a free-fall machine. This is also why split conversions on EDGE String were 8% higher than on free-fall.

The results of the study point to the slightly lower strike conversion rate on EDGE String being offset by higher spare and split conversion rates – resulting in overall scorability on EDGE String very close to free-fall.



## Conclusions

This research study on scoring and pinfall behavior of EDGE String compared to free-fall machines provides practical insight into real-world performance on EDGE String as compared to free-fall machines.

**This study's findings support our hypothesis that the bowling experience, pinfall, and overall scoring on EDGE String is very close to that of free-fall.**

The performance and play on EDGE String compared to free-fall, as found by this study, is why Andrew Oram, CEO, IBF, referred to EDGE String as "the leading string technology available for sport bowling".

- At just 1.3 pins higher, the overall scorability on EDGE String is very close to free-fall

- With a strike conversion rate just 1.4% lower than free-fall, the strike performance on EDGE String is very close to free-fall
- Pinfall and pin action on EDGE String is different than free-fall, but it does not appear to be enough that gameplay integrity is compromised – the game remains one of skill and challenge
- Bowlers may need to adjust their approach when playing on EDGE String versus free-fall in certain situations - not unlike what they must do for differing lane conditions, balls, pins, etc.
- The performance and bowling experience on EDGE String under sport applications is likely acceptable for sport league bowlers, given 97% of participants in the study indicated they would bowl on EDGE String in a competitive sport tournament



## Participant Feedback



"What I noticed most was the off hits—like the half pocket hits, the light mixers and like spare shooting — were the biggest differences between the EDGE String and the free-fall. But, the flush hits seemed almost exact. I didn't see a huge difference in that."

**- Kenny Ryan, *Some Strings Attached Invitational, Champion***



"As a competitive bowler you want to make sure that they score true to the way you throw the ball and I felt like the string machines did today...I definitely think that these machines should be USBC approved. I think they're a step in the right direction for bowling."

**- Jason Couch, *Some Strings Attached Open Champion***



"One thing that surprised me is that on the string side, you get a perfect rack every single time. I shot 300 on EDGE String and I can't wait to bowl on it again."

**- Carlos Eduardo Granados, *Some Strings Attached Invitational, 300 Game***



"I think it's eye opening to see how the pins react in a different way, but in the end it's bowling. It's the spares that you make that maybe you wouldn't ordinarily make. I think that's the biggest surprise".

**- Verity Crawley**



"Before I came out here I was already thinking, 'Oh, carry percentage is going to be so much higher on EDGE String versus the free-fall machines.' And it really wasn't. What surprised me the most about the EDGE String is that there was still really good pin action. It almost didn't even seem that different from traditional bowling."

**- Ashly Galante**



"I feel like this is one of the better string pin machines out there. I've seen a couple of videos online and the balls quite not going through the pins the right way, and I was really impressed with how my ball was going through the pins."

**- Nate Garcia**



"Initially I thought you'd be able to get a lot more off-hits on the string. And it was just the opposite. You had to hit them really well, you had to make good shots, but when you did hit them well, you got the strikes. The expectation was that there would be some sort of noticeable difference. When you went from one end of the house to the other you kind of forgot for a moment, until you saw the pins reset. For me, I actually didn't notice at times that I was bowling on a string machine."

**- Chris Keane**



"I expected it to be a little bit more of a difference between the free-fall and the string machines. I think that the machines have come a long way, so I am actually positively surprised."

**- Carlos Tobon**



"They're definitely more realistic than the string machines I've bowled on in the past. Bowling on the EDGE String, the carry was a lot more realistic. And I actually really liked it...I would forget I was bowling on the string pins."

**- Elise Bolton**



"What surprised me most about bowling on the EDGE String was actually how realistic it is. When I heard stories about what it was, I kind of thought 'oh, it's not going to be good,' but it's so close to free-fall pins that it was good."

**- Ron Martin III**



## Join the String Bowling Revolution!

Stay up to date with the industry's only comprehensive source for information on global string machine trends. Find everything you need to know about this game-changing technology—all in one place—brought to you by the string machine and industry leader, QubicaAMF.

[www.qubicaamf.com/string-bowling-revolution](http://www.qubicaamf.com/string-bowling-revolution)



View the EDGE String Pin Action Video



Watch what Owner, Mark Bowen of Dover Bowl has to say since installing EDGE String



Hear Owner Becky Bowersox of Lewistown Lanes share her EDGE String story



See what league bowlers from Lewistown Lanes have to say about their experience bowling on EDGE String

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