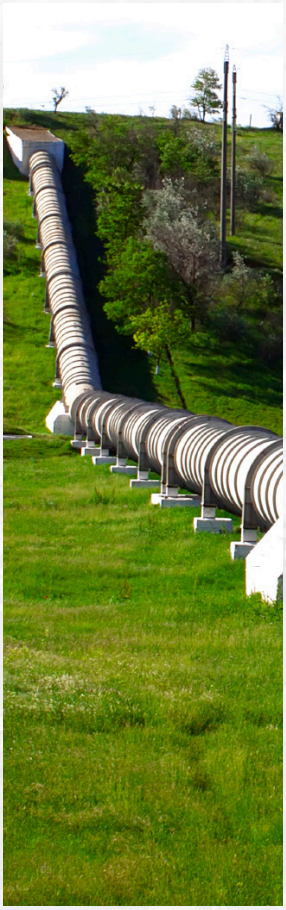


OEM PERFORMANCE PRESSURE SENSORS

WE DESIGN AND DELIVER
PREMIUM SENSING SOLUTIONS
www.setra.com

setra®

WHO IS SETRA?

Setra Systems, Inc. was founded in an age of transducer innovation. Our founders, Dr.Y.T. Li and Dr. S.Y. Lee were Professors of engineering at the Massachusetts Institute of Technology and co-developers of the Variable Capacitance Transduction Principle. Building on this heritage of innovation, Setra has designed and developed the most comprehensive product lines of pressure sensing transducers in the world. Setra has been innovating Test & Measurement sensor designs for over 50 years and has become a leader in the pressure transducer market.

- **Made in the USA**
- **Industry Leader for 50 years**
- **Innovator of the variable capacitance principle**
- **5-Sigma Quality**
- **95% On Time Delivery**
- **99.8% Quality Rating**
- **10+ Million Sensors Shipped**

Corporate Headquarters & Production Facility

Boxborough, Massachusetts, USA

HIGH QUALITY SENSORS WITH BEST IN CLASS ENGINEERING

Not all pressure sensors are created equally. Through Setra's engineering expertise and a large breadth and depth of general industrial products, customers are sure to find the product their specific application requires across a wealth of different industries.

WHETHER YOU NEED:

- **Variable Capacitance**
- **Thin-Film**
- **MEMS**
- **High Price to Performance**
- **Modular Design**
- **Fast On Time Delivery**
- **Wide Range, High Accuracy**

SETRA HAS YOU COVERED

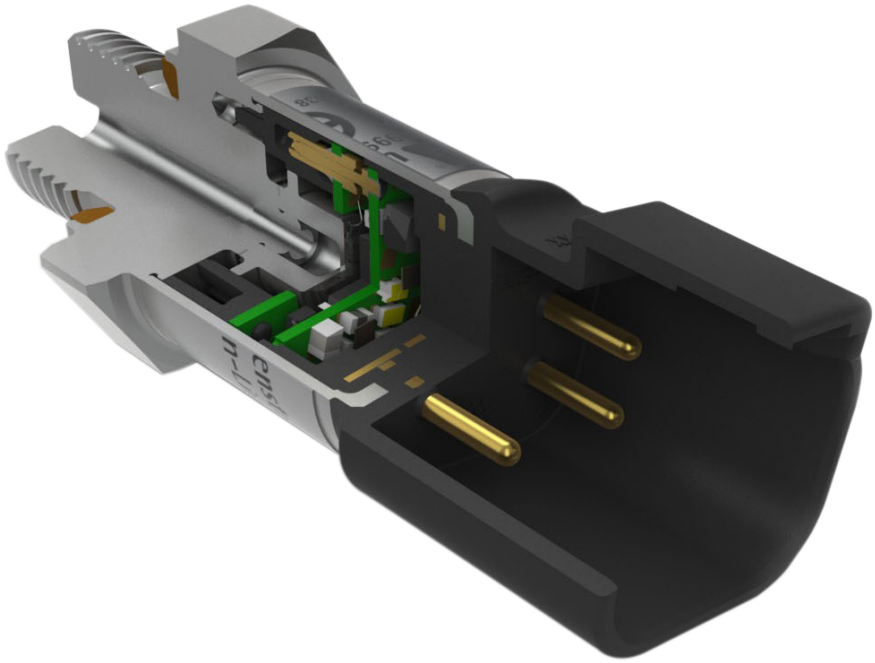
Contact us today

(800) 257-3872

www.setra.com

Model 3100
Model 31HX

Premium Price-to-Performance
High Quality: <0.1% Failure Rate
Long-Term Stability (<0.2%FS/YR)



- ±0.25% FS Accuracy
- No Oil Fill - Prevents Thermal Instability & Leakage
- Wide Choice of Pressure Ranges: 75 PSI-32,000 PSI
- Accuracy Specified Over Full Temperature Range
- Small Footprint - Less than 1" Diameter
- Dual Temperature and Pressure Output
- Choice of Current, Voltage, or Ratiometric Outputs
- Reverse Wiring Protection
- All Welded Stainless Steel Construction
- CE & RoHS Compliant, UL Approved
- IP67 Rated

NON-OIL FILLED DESIGN

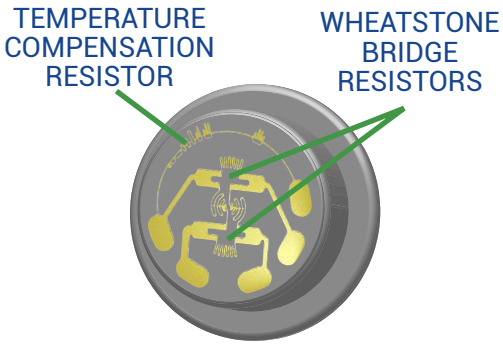
All of Setra's sensors feature a non-oil filled design which is resistant to positional effect and provides a stable zero-level output regardless how or where the sensor is installed. Non-oil filled sensors also eliminate the risk of contamination in the event of a diaphragm failure which could ruin entire systems and cost thousands of dollars to repair.

RUGGED DESIGN

The 3100/31HX series' compact welded stainless steel design is constructed to protect the sensor in demanding industrial environments. A robust internal design ensures that the transducers can survive high levels of vibration. A high level of EMC protection allows the transmitters to perform to the most stringent of industrial standards.

SETRA'S TECHNOLOGY

Thin film strain gauge technology provides a very linear and predictable output signal over a wide temperature range, which enables Setra to provide an inherently stable and accurate sensor element in high volumes and at a low cost. Capacitive technology facilitates a true low range sensor design offers high performance with no additional amplification required to meet range requirements. Our OEM product line employs both technologies and when coupled with robust electronics, proves that **SETRA HAS YOU COVERED.**



THIN FILM

Model 209
Model 209H

Rugged 316L SS Construction (209H)
Non-Oil Filled Design
High Accuracy: ±0.25% FS

- Small Package Design for OEM Applications
- High Overpressure Option Available on Select Ranges
- Compatible w/ a Variety of Gases & Liquids
- Operates on Low Cost Unregulated DC Power
- Suitable For High Shock & Vibration Applications
- No Seals or O-Rings to Cause Leakage
- CE & RoHS Compliant

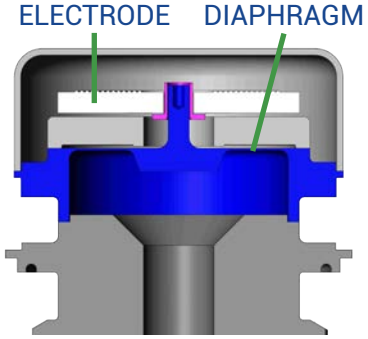
VERSATILE WETTED MATERIALS

When measuring liquids and gases, the type of material each pressure sensor is constructed from can be critical. 17-4PH is commonly used in various non-corrosive or mildly-corrosive applications. Using 316L stainless steel will work in applications where the pressure medium exhibits more corrosive properties, such as hydrogen. Setra has a solution to fit any need.

HIGH OVERPRESSURE

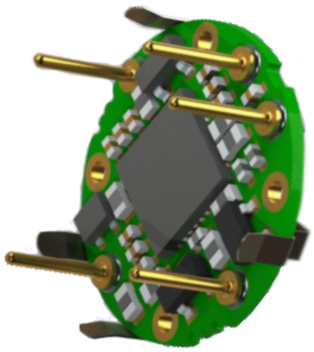
Models 209 and 209H are designed and built to withstand demanding applications. The industrial construction, with optional positive overpressure stop, enables the sensor to withstand overpressure conditions up to 16X the rated range.

OR



CAPACITANCE

+



ROBUST ELECTRONICS

MAKING THE CASE

Setra has solved transducer problems in nearly every corner of the world. Here are a few case studies to give you an idea of some typical challenges and how we resolved them.

INSTRUMENTATION

Model 3200

The customer is a leader in instrumentation for the Fire and Safety industry. The customer's product combines a digital flowmeter and traditional style pressure indicator on one compact display. The electronic pressure indicator eliminates freeze-up and leakage problems found in traditional liquid filled gauges. These devices measure both the intake from hydrant and discharge pressure.

CUSTOMER PROBLEM

Inadequate water supply was leading to cavitation within the pump causing replacement/failures of the pump impeller. The old hand plumbed gauge style systems had a high installation cost and required a skilled installer to run tubing.

SETRA SOLUTION

Setra provided the 3200 pressure transducer to monitor intake pressure and maintain water supply for all discharge nozzles on the fire trucks. The 3200 gives the customer the feedback to prevent pump cavitation. Install cost is reduced while providing a reliable sensor.

REFRIGERATED CASES

Model 3100

The customer is recognized as a world leader in manufacturing, selling, installing and servicing merchandising equipment and refrigeration systems for customers in the retail food industry. Pressure sensors typically reside at two main locations in the system: the output side of the evaporator and the discharge side of the compressor.

CUSTOMER PROBLEM

The constant freeze/thaw cycles in a refrigeration environment make it one of the harshest environments for a pressure transducer. The most critical component in most systems is the expansion valve.

SETRA SOLUTION

Setra provided the 3100 which can withstand the harsh environment of the application. The 3100 was able to provide the customer with a rugged and reliable pressure sensor that was able to withstand the many freeze/thaw cycles in refrigerated cases.

COMPRESSORS

Model 3100

Most cooling systems, employ the refrigeration process known as the vapor compression cycle. At the heard of the compression cycle is the mechanical compressor. A compressor has two main functions: to pump refrigerant through the cooling system and to compress gaseous refrigerant in the system so that it can be condensed to liquid.

CUSTOMER PROBLEM

Using a competitors pressure transducer, the customer was experiencing product failures often from high vibration. The previous sensor had low price to performance and created costly equipment shutdowns.

SETRA SOLUTION

Setra provided the 3100 which features an all-welded stainless steel body free of epoxy or elastomer seals, creating a totally hermetic seal on the pressure side of the sensor, which is free of potential leak paths.

AUTOCLAVE

Model 209

For over 50 years, this customer has been a leading supplier of technologically advanced autoclaves and composite systems. An autoclave is a large, steel vessel or chamber that circulates steam at high temperatures and pressure to sterilize various items, or as part of an industrial process. The aerospace industry requires autoclaves for parts manufacturing and processing.

CUSTOMER PROBLEM

The customer was using a competitor's transducer that was costly and had a high failure rate in the application. The larger the autoclave, the more pressure transducers are required to monitor pressure.

SETRA SOLUTION

Setra provided the 209 which is a cost effective solution to their previous sensor. The 209 can be ordered in a compound range which can cover both the vacuum and positive ranges needed in their autoclave. The price to performance of the 209 was preferred by the customer.

NATURAL GAS PIPELINE

Model 209

Natural gas pipeline monitoring handles gas distribution encompassing monitoring, alarming, data recording and value control management. These can be configured with pressure transducers for the particular application. Within the panel there is a custom designed high efficiency solar charging station with charge regulation to maintain sufficient charge of the on board battery.

CUSTOMER PROBLEM

The customer's previous design incorporated a strip-chart recorder for monitoring the pressure of the natural gas inside a transmission and distribution grid. Their old system for recording data was manual, slow and costly to capture.

SETRA SOLUTION

Setra provided a higher performance and automated solution which saved time and money. Setra developed a custom 209 range that met the customers specific application requirements.

GAS CONTROL MANIFOLD

Model 209

The customer is a leading manufacturer of gas control manifold systems. Their fully automatic manifold is designed for demanding applications where monitoring gas pressure loss and cylinder level is critical for their customers. When their manifold system detects a gas cylinder is low, it automatically switches over to a secondary cylinder.

CUSTOMER PROBLEM

This customer was not using an automated process therefore when tanks were empty, manufacturing processes were interrupted. They needed a reliable pressure sensor to let them know when the tank needed to be switched.

SETRA SOLUTION

Setra provided the customer with the 209 in order to actively monitor the inlet pressure to their gas control manifold systems. The high accuracy and small size was the selling point for this customer.

HYDROGEN

Although hydrogen is in its infancy as a fuel source, its future is incredibly bright. The technology behind hydrogen fuel cells is improving by the day and its viability as a replacement to the internal combustion engine seems likely. Hydrogen is already being used in specialty vehicles such as forklifts and buses, and it's only a matter of time before infrastructure is in place to serve the consumer automotive market. Why do hydrogen fuel cells have such great appeal? Because their only byproducts are heat and water vapor, making hydrogen fuel cells a truly zero-emission locomotive technology.

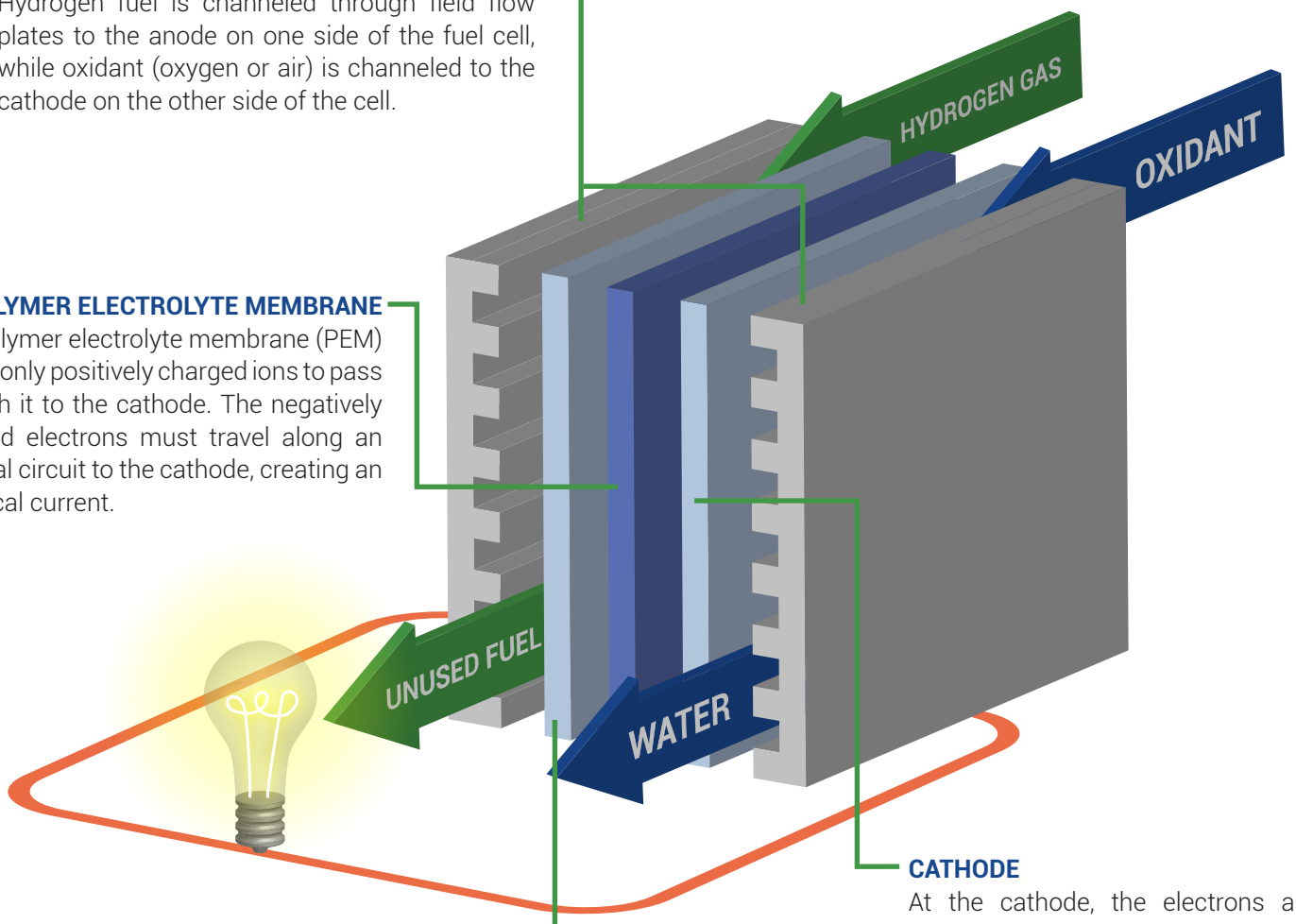
HOW DO FUEL CELLS WORK?

FLOW FIELDS

Hydrogen fuel is channeled through field flow plates to the anode on one side of the fuel cell, while oxidant (oxygen or air) is channeled to the cathode on the other side of the cell.

POLYMER ELECTROLYTE MEMBRANE

The polymer electrolyte membrane (PEM) allows only positively charged ions to pass through it to the cathode. The negatively charged electrons must travel along an external circuit to the cathode, creating an electrical current.



ANODE

At the anode, a platinum catalyst causes the hydrogen to split into positive hydrogen ions (protons) and negatively charged electrons.

CATHODE

At the cathode, the electrons and positively charged hydrogen ions combine with oxygen to form water, which flows out of the cell.

◆ **Model 3100** 

● **Model 209H** 

HYDROGEN & 17-4 STAINLESS STEEL

When hydrogen is used as a process media, special precautions need to be taken when choosing the correct type of pressure transducer. Most pressure transducers on the market use 17-4 stainless steel wetted materials, a common grade steel that is durable and effective for most applications. However, hydrogen in direct contact with 17-4 stainless steel can cause corrosive embrittlement over time which can lead to a diaphragm failure and dangerous leaks. Setra's Model 3100 and 209H utilize 316L grade stainless steel, a robust material resistant to corrosion and are ideal for these types of applications.

MOTIVE POWER

Hydrogen fuel cells are changing the way material handling equipment and transit vehicles are designed. The energy provided by the fuel cell provides clean and consistent power throughout the duty cycle; increasing productivity and reducing fueling/re-charge time of the equipment.

Pressure transducer applications:

- Tank Pressure for Fuel Level
- Inlet Pressure Regulation at Fuel Cell

HYDROGEN PRODUCTION & STORAGE

With all of the advantages of using hydrogen as a fuel source, the challenge is finding the best method for managing your supply. Hydrogen can either be produced through the reforming of a methane-based gas or hydrogen can be delivered and stored on-site ready to use.

Pressure transducer applications:

- Intake pressure of gas for the reforming process
- Process and distribution pressure
- Storage pressure

POWER GENERATION

As technology advances, the world becomes more dependent on power to run critical processes and to manage and store data. As either a primary or backup power source, fuel cells provide clean and reliable power, enabling either separation from the power grid or providing uninterrupted backup power to a facility.

Pressure transducer applications:

- Hydrogen storage level
- Inlet Pressure Regulation at Fuel Cell

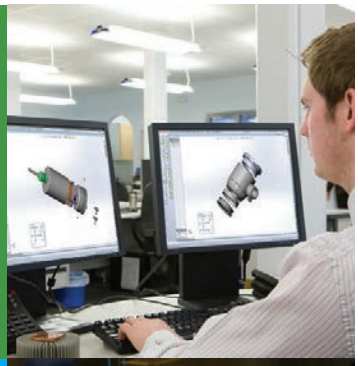
SETRA SELECT

You can lean on our staff of cross-trained and highly skilled engineers and technicians to solve your most unique challenges. We call it Setra Select because the options are all yours. With Setra, you can rest assured that when everything is at stake, we will put the right technical team members on the job. With over a dozen seasoned engineers and technicians, there will likely be nothing new to us about your problem. We will first zero in on your target specs and determine if they are achievable. Then we will break down the problem and select

1

CONCEPT

Can it be done? If the answer is yes (and it usually is), we move to platform choice and vetting of engineering options.



2

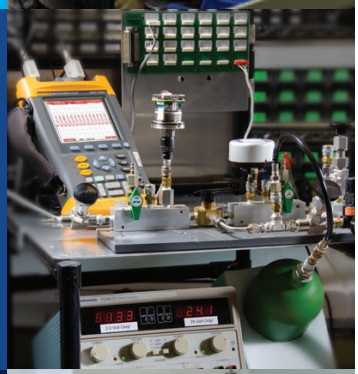
PROTOTYPE

Next, our Design Engineers engage with our manufacturing team and collaborate on producing a functional prototype using in-house, standard manufacturing approaches wherever possible.

3

EVALUATION

After in-house testing, the prototype is sent to you for evaluation and feedback. You send it back and iterations are made until you are fully comfortable that production models of the prototype will drop in perfectly.



4

PRODUCTION

Documentation is finalized and production associates are trained in preparation for manufacturing a pilot run and first production order.

the right technology platform for the application. Every aspect of your application's mechanical, electrical and environmental constraints will be considered. We will then vet such controlling variables as materials, enclosure geometries, sealing methods, and manufacturing methods. Once concept engineering is complete we move to prototyping, evaluation, and production using our regimented process model.

WHAT'S CUSTOMIZABLE?

ELECTRICAL CONNECTOR AND OR INTERFACE

There are many standards for electrical connections. Many of our models can be modified to accommodate a variety of standard connectors or custom wiring pin-outs. We can guide you through our available options or potentially customize the electrical connector to your specifications.

Examples include:

- Cable-wire connections
- Wire terminals
- Military connectors
- Industrial connectors

FIRMWARE/INTEGRATION

Setra can help customers create unique product features by modifying our standard firmware and customizing it according to specific customer or application requirements.

Examples include:

- Custom power-up splash screens with custom logos
- Integration of proprietary communication protocols
- Addition of specific product functionalities

ELECTRONICS

The electronics are responsible for fundamental features and important performance aspects of a pressure transducer. Setra offers customized electronics to achieve desired excitation inputs and signal-conditioned outputs.

Examples include:

- Excitation range
- Signal output
- Electromagnetic interference (EMI) performance
- Improved thermal performance over specified temperature range

ENCLOSURE

The enclosure serves an important function in protecting the transducer's electronics and sensing element from the operating environment (e.g. moisture ingress and EMI shielding). In most cases, Setra Application Engineers can work with you to find a good fit for your application. For special demanding applications, Setra can make enclosure modifications to better suit the operating environment.

Examples include:

- Stainless steel
- Painted or anodized aluminum
- Plastic
- Custom labels

SENSING ELEMENT

There are many standards for electrical connections. Many of our models can be modified to accommodate a variety of standard connectors or custom wiring pin-outs. We can guide you through our available options or potentially customize the electrical connector to your specifications.

Examples include:

- Cable-wire connections
- Wire terminals
- Military connectors
- Industrial connectors

PRESSURE PORT / FITTING

There are many ways to make a pressure connection. Call us if you cannot find your preferred pressure connector among our standard offerings. We can guide you through our available options or potentially customize the pressure port(s) to your specifications.

Examples include:

- Tapered threads
- Straight threads with o-ring seals
- Tube fittings
- Sanitary fittings
- Vacuum fittings

OEM PERFORMANCE PRESSURE SENSORS

CELEBRATING 50 YEARS

Founded in 1967, Setra Systems, Inc. is a leading designer and manufacturer of pressure, acceleration, and weight sensing devices. Setra's founders, Dr. Y.T. Li and Dr. S.Y. Lee, were co–developers of the variable capacitance transduction principle, the innovative force sensing technology which is the heart of Setra's products.

PREMIUM SENSING SOLUTIONS

MADE IN THE **USA**

MADE IN THE USA

Since our founding, we have been proudly producing all of our transducers for sale in the United States at our 100,000 sq. ft. Boxborough, MA facility. Setra is an ISO 9001-2008 certified manufacturer with robust and mature processes at work to continually optimize team performance.

FORTIVE

DISCIPLINED BUSINESS MODEL

Setra is part of the Fortive group of companies, a diversified industrial growth organization based in Everett, Washington, with 24,000 employees worldwide. The Fortive Business System (FBS) is the cornerstone of our culture and our ultimate competitive advantage. It drives every aspect of our work, our strategy and our performance. We use FBS to guide our decisions, measure how well we execute and develop innovative ways to do even better.

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