

# Paul D. Terpstra, P.E.

## **EXPERIENCE:**

### August 2017 to Present – Brake Audit

Co-Founder – BrakeAudit provides drive-through automatic brake inspection systems used in fleet management, inspection screening, eDVIR, and autonomous vehicles and platooning.

### April 2012 to Present – Klover Products Inc.

President - Klover Products was incorporated jointly with an Innalytical Solutions customer to produce unique products for the television broadcast industry. Our first product was the parabolic microphone designed at the request of Fox Sports. We have expanded that product line to three different sizes. These parabolic microphones have been used to broadcast the Super Bowl, World Series, MLB All-Star game, NBA All-Star game, and the NCAA men's basketball tournament. Klover Products' second product line is a system of removing moisture and debris from video camera lenses.

2014 - Created the "Sound Shark Audio" division to expand the parabolic microphone products into the consumer market.

2019 – Purchased former partners share of the company.

### January 2004 to Present - Innalytical Solutions Inc.

President - Providing engineering consulting services to a wide variety of customers including acting as expert witness in legal matters.

2009 to 2018 - Operated the "Machine Doctors" division to focus on the machinery service area such as troubleshooting, upgrades, and retrofits.

2011 to 2016 - Operated the "Investigative Engineers of Southern Wisconsin" division to focus on forensic engineering services.

Significant projects include:

- Mechanical design of a spacer transport system and gas fill station for an automated assembly system of glass units (dual pane residential window panels)
- Mechanical design of a series of assembly cart for LEAN assembly of tractor axles
- Design of parabolic microphone that began Klover Products
- Mechanical and electrical design, programming, and project management of a tire assembly system for off highway construction equipment
- Mechanical design, electrical design and programming of two gas strut assembly systems for off highway dump trucks
- Mechanical and electrical design of an autonomous servo driven mobile television stage – the lift arms from this design were used to lift the roof of the broadcast stage for Super Bowl 47 pre-game, half time, and post game shows
- Finite Element Analysis of the roof and roof rack for an automobile mounted sensor used for laser driven terrain measurements
- Mechanical design of robotic assembly and packaging system for injection molded plastic parts for second tier supplier to the automotive industry

- Replaced the entire CNC control system of two custom built punch press / plasma cutters – larger one capable of stamping and cutting ½” x 4’ x 10’ plate

### January 1985 to January 2004 - Gilman Engineering & Manufacturing

May 2003 to January 2004 – Senior R&D Engineer

The entire R&D Department was eliminated due to budget cuts in May of 2003

A patent application was filed for a unique assembly process for clutch plate assemblies

May 2001 to April 2003 - Director of Research & Development

Responsible for setting direction of R&D efforts and overseeing those efforts

Responsible for new ancillary modules for the IntelliMove and all servo applications utilized within the SDST diesel fuel injector project

Created two patentable concepts for completing final function tests of rack & pinion steering gears – a patent application has been made for the first of these concepts

Created an adjustable height workstation for LEAN assembly systems which was patented

February 1997 to May 2001 - Manager of Research & Development

Created two programmable part-handling devices - A patent has been granted for one of these devices called IntelliMove.

Created a unique light duty conveyor system

Created and managed R&D projects for cost reduction and standardization

Prepared proposal and assisted in sale of a unique full-automated assembly system for SDST diesel fuel injectors that utilized 80 programmable part-handling devices

March 1995 to February 1997 - Senior Application Engineer

Prepared proposals and assisted in the sale of assembly systems as large as \$40,000,000. Generated sales of over \$67,000,000.

Designed and implemented six vision inspection stations for a large assembly project

Created a simplified part inverting mechanism which was patented

January 1991 to March 1995 - Senior R&D Engineer:

Applied, estimated and sold SmartConveyor transport systems

Project manager for first SmartConveyor transport systems

Controls project engineer for second SmartConveyor systems

Developed control system for SmartConveyor (CAN-bus I/O)

Implemented one of the first real-world Device-Net control systems

Applied, sold, designed large gantry robot system

Simulated assembly systems using "Witness" software

Designed six axis (Steward Platform) robot for assembly of automobile transmission component. (The system was modeled in 3D solid geometry using CATIA software.)

A patent has been granted for this six-axis robot

June 1988 to December 1990 - R&D Engineer:

Responsible for all control work in R&D (Allen-Bradley, Modicon and GE PLC's)

Created simulation package for assembly systems

(Approximately 6000 lines of “C” code)

Developed new heavy-duty transport system called SmartConveyor

Received two patents on the SmartConveyor

The SmartConveyor design has been featured in Design News, Machine Design,

Production, and Automotive News magazines

June 1986 to June 1988 - Senior Design Engineer:

Acted as lead designer and unofficial Project Manager for several large projects

including: Drill & Mill system for GM APV mini-van and robotic instrument panel assembly system

January 1985 to June 1986 - Mechanical Design Engineer:  
Responsible for debug of several systems  
First mechanical designer to use CAD system (IBM-CADAM)

June 1983 to December 1984 - AMF-Potter & Brumfield, Princeton, IN

Development Engineer:  
Designed and implemented robotic test system  
Responsible for debug of purchased automated equipment  
Responsible for all control work on Modicon PLC's

June 1980 to May 1983 - Fisher Controls, Marshalltown, IA

Cooperative Engineer  
Gained hands-on assembly and machine shop experience  
Implemented new machining process & developed control valve linkage

**EDUCATION:**

BS, Mechanical Engineering, Iowa State University, Ames, IA - 1983  
MA, Management, Summa Cum Laude, Regent University, Virginia Beach, VA -2001  
Technical Certificate in Reliability & Maintainability, Blackhawk Technical College,  
Janesville, WI  
Fully Trained in SolidWorks - (Certified SolidWorks Professional)  
Factory trained integrator for several different motion control and CNC product lines.  
Certified in Fire Investigation by Peter Vallas Associates, Inc.

**LICENSES:**

Professional Engineer – States of Wisconsin and Illinois

**PATENTS:**

US-5086910	Zone Controlled Conveyance System
US-5246096	Rotate/Translate Conveyor Module
US-5738483	Lift & Invert Mechanism
US-6041500	Automatic Assembly Machine and Method Utilizing Six-Axis Positioning Device
US-6428267	Pick & Place Device Having Two Parallel Axes
US-6575212	Adjustable height workstation
US- 9014402	Acoustically Isolated Parabolic Sound Pickup Assembly (Klover Products)
US-9260907	Triple Pane Window Spacer Having A Sunken Intermediate Pane (Guardian IGU – listed as co-inventor as result of work on manufacturing process during engineering project)
US-9677321	Triple Pane Window Spacer Having A Sunken Intermediate Pane (Guardian IGU – listed as co-inventor as result of work on manufacturing process during engineering project)
US-D801736	Portable Cutting Table
US-9992569	Camera Mounted Parabolic Microphone (Klover Products)
US-10486675	Vehicle brake monitoring through ultrasonic emissions
Application	Provisional application Tension Limiting Ratchet Mechanism

**AWARDS:**

Finalist for the PACE award for innovation in the automotive industry  
Nominated for Wisconsin Society of Professional Engineer's New Product of the Year award