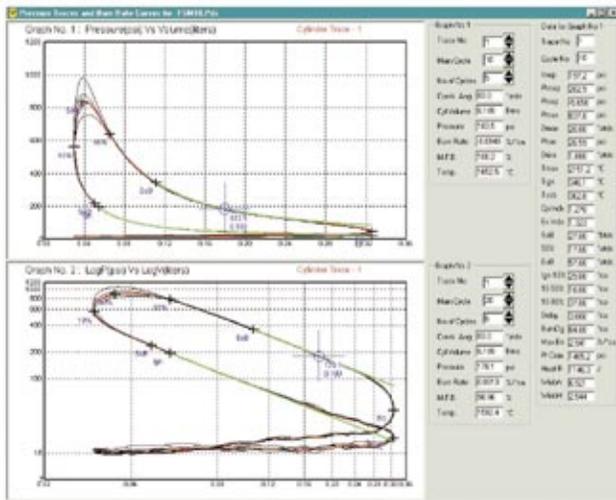


**OPTIMUM  
Power Technology**

**Optimizes**

**Briggs & Stratton's  
New Engine Performance**

**With PTrAn**





**B**riggs & Stratton Corporation is the world's largest manufacturer of air-cooled, aluminum alloy gasoline engines for lawn and garden equipment and for generators, pumps and pressure washers used in construction, agricultural and consumer applications.

**Briggs & Stratton** is currently designing and developing a 75cc OHC engine for India's moped and scooter market. The Indian market demands engines that are powerful, fuel-efficient, reliable, emission-compliant, and cost-effective.

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— Dan Karrels, Engineering Specialist  
for Briggs & Stratton

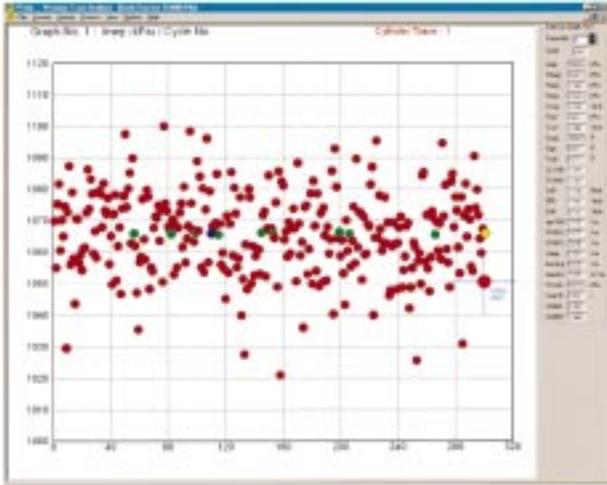
## SEEKING A SOLUTION

To meet these challenging demands, **Briggs & Stratton** engineers needed a cost-effective method to analyze combustion. Originally, they solicited a proposal from a consultant to custom-design a pressure trace analysis tool.

In the fall of 1999, another alternative presented itself when Dan Karrels, Engineering Specialist for **Briggs & Stratton**, discovered **OPTIMUM Power Technology** at an industry conference and exhibition. While speaking with **OPTIMUM's** representatives, he learned about PTrAn, a powerful and intuitive software package used to perform complete analysis of measured pressure traces.

"I received a demo Compact Disc and evaluated PTrAn's capabilities, which were ample," says Karrels. The Windows-based software was developed to easily process most ASCII and binary data formats, and its user-defined software filtering assures accurate analysis of the measured data. Further, it combines industry standard combustion computations with advanced graphical presentations of the results. The **Briggs & Stratton** engineering team was impressed and decided to further investigate **OPTIMUM**. "We were also pleased and surprised to find that PTrAn not only had strong capabilities," says Karrels, "but its price was nearly one-fifth the consultant's proposed fee."





*Cycle to Cycle  
Data Variation.*

## GETTING PEAK PERFORMANCE

**Briggs & Stratton** engineers adopted PTrAn in the winter of 1999. Initially, they used the software to analyze the results of measured pressure traces from the scooter engine to determine if incomplete combustion was keeping the engine from performing at its peak capability.

“In-cylinder pressure measurement is an invaluable tool in engine design and development,” says Karrels. PTrAn uses industry-standard techniques to calculate many parameters including burn rate, Indicated Mean Effective Pressure (IMEP) and mass fraction burned from in-cylinder pressure data.

The software uses powerful, user-definable filtering to digitally remove noise from the measured traces prior to analysis, and performs calculations that give **Briggs & Stratton’s** engineers a better picture, cycle-by-cycle, of what’s happening in the engine during the combustion process.

“Prior to using PTrAn,” says Karrels, “we had to develop burn calculations by hand, which was extremely time-consuming. It’s nearly impossible to write extensive burn calculations and thermodynamic formulas. By contrast, PTrAn automates these intense calculations, saving us a significant amount of time.”

## AVOIDING ‘BUILD AND BUST’

“With PTrAn, we didn’t have to write any special code,” says Karrels. “**OPTIMUM’s** PTrAn Version 2.0 contains many new features that meet all of our combustion analysis requirements. PTrAn graphically presents analysis results in a Windows format, so interpretation of the data is very straightforward.

Transducer side effects such as noise, thermal shock and thermal drift can seriously compromise the validity of measured data. PTrAn automatically alerts **Briggs and Stratton** engineers to the presence of thermal shock and drift in the data, indicating to them if they need to redo a test. “We depend on the accuracy of PTrAn’s analysis,” says Karrels.

“The shock evaluation function keeps us from having to ‘build and bust’ expensive – not to mention time-intensive – prototypes,” he adds. “We also like the fact that PTrAn accepts traces in many ASCII and binary formats.” The software handles large files with up to 20 traces and 2000 cycles, and has a unique batch conversion and processing facility to handle very large quantities of data. “PTrAn converts data extremely quickly and produces results fast,” says Karrels.

In addition to clear interpretation of data, integration of PTrAn with existing systems has been smooth. “PTrAn is a very flexible package that adapts to multiple hardware types and platforms,” says Karrels. Binary data from Nicolet, AVL and DSPx high-speed data-acquisition systems can be read directly into PTrAn.

Although PTrAn was first applied to analysis of the scooter engine, its suitability to all other engine applications is another aspect of flexibility that **Briggs & Stratton** values.

## MEETING FUTURE NEEDS

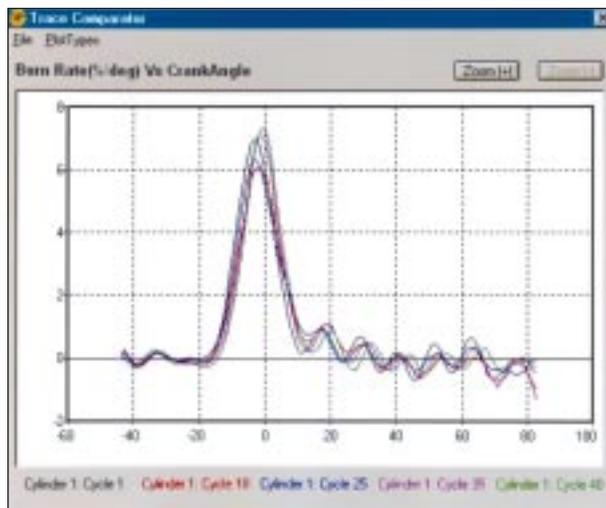
As they've used PTrAn during the development of the scooter engine, **Briggs & Stratton** has been impressed with **OPTIMUM's** responsiveness. "They are extremely helpful," Karrels says. "We are pleased with the level of service they provide. If we have a question, we never have to worry about someone getting back to us. They respond immediately."

Looking forward, **Briggs & Stratton** plans to expand their use of PTrAn. "We can maximize the benefits and productivity of combustion analysis throughout the company," says Karrels, "whether we use it to analyze pressure traces from engines used for lawn and garden equipment or for light transportation powertrains used throughout the world. As long as we design and develop our engines, we can use PTrAn to optimize parameters for maximum combustion efficiency. This will make our engines burn cleaner, resulting in lower emissions and higher performance." ♦

*"We can maximize the  
benefits and productivity  
of combustion analysis  
throughout the company..."*

— Dan Karrels, Engineering Specialist  
for Briggs & Stratton

*Cyclic Variation of Burn Rate*



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