Title line 1
Title line 2

Author 1 full name[a,*], Author 2 full name[a,b], Author 3 full name[b], . . .

[a]*Author affiliation 1*
[b]*Author affiliation 2*
Continue the list of affiliations as needed, with one per line

Abstract

All text throughout this document is in Times New Roman font. For the purpose of estimating paper length, these formatting instructions must be followed exactly. The fonts and line spacings that are used in a *Proceedings of The Combustion Institute* paper are specified here. The title is **17pt bold**, centered, with a line spacing (for multiple-line titles) of 20pt. The authors' names are 13pt, centered, with a line spacing (for cases where the names require more than one line) of 15pt. The affiliations are 8pt italic, centered, with a line spacing of 10pt. Authors are linked to their respective affiliations as indicated above. You can consult a Volume 42 *Proceedings* paper for the information to include in each affiliation. The asterisk denotes the corresponding author. The abstract text is 9pt, justified, with a line spacing of 10pt, and runs the full text width of 5.67 in (144 mm). The semicolon-separated list of keywords (below the abstract) is 8pt, left-justified, with a line spacing of 10pt. In LaTeX, the desired line spacing can be set by following the format of the template unchanged. An abstract is one paragraph of approximately 100-300 words and typically fills up to 15-20 lines. The main text begins immediately following the abstract, novelty and significance statement, keywords, and corresponding author note with this page numbered 1. The main text is up to six pages so may continue until the bottom of page numbered 6. This is followed by references on unnumbered page(s). In exceptional circumstances, the authors may request an extended length of two additional pages, so main text ending at the bottom of page numbered 8, with separate justification. Requests for extended length are more likely to be approved at the revision stage than for the initial submission.

Novelty and significance statement

A novelty and significance statement is required for all manuscripts. The minimum length is 50 words, and the maximum length is 150 words. The statement describes the work's novelty and significance and should not simply outline the objectives or the conclusions/results.

Keywords: Keyword 1; Keyword 2; Keyword 3; . . .

*Corresponding author.

1. Introduction

Start the main text here, using two-column format. The width of each column is 2.67 in (67.7 mm), and the space between the two columns is 0.33 in (8.47 mm). As stated in the Abstract, Times New Roman font is used throughout.

The main text uses 9pt font with the line spacing set to exactly 10pt, and is justified. The total height of each column, including headings and spaces, is 8.5 in (216 mm). There is no extra space between paragraphs. The first line of each new paragraph is indented 0.15 in (3.8 mm).

2. Sections and subsections

Sections are numbered sequentially using Arabic numerals. Section headings are left-justified, using 10pt bold font, and are followed by a 10pt space.

Subsections are numbered sequentially within each section using Arabic numerals, as indicated below. Subsection headings are left-justified, using 10pt italic font, and are followed by a 10pt space.

2.1. Subsection heading

Here is subsection 2.1 text.

2.2. Another subsection heading

If sub-subsections are used, the font and spacing for sub-subsection headings are the same as those for subsection headings, and the numbering is sequential within each subsection. For example, the first sub-subsection for the current subsection would be numbered 2.2.1, the second would be numbered 2.2.2, and so on.

3. Figures, tables, and equations

Figure and tables are to be inserted at the location in which they are expected to appear in the paper. No separate list of figures and tables is to be provided.

Single-column figures (*e.g.*, Fig. 1) should fit within the 2.67 in (67.7 mm) column width. Double-column figures (*e.g.*, Fig. 2) should be sized for legibility, and the image must fit within the 5.67 in (144 mm) full text width. Figures are numbered sequentially using Arabic numerals. Figure captions use 8pt font with 10pt spacing.

Single- and double-column tables are inserted similarly. The font size throughout a table is 8pt, with 10pt line spacing. Table 1 is an example of a single-column table, and Table 2 is an example of a double-column table.

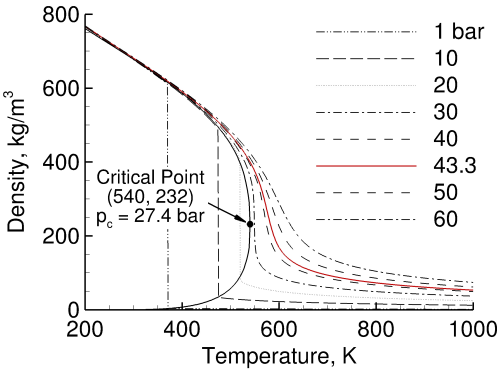


Fig. 1: Density versus temperature of n-heptane.

Equations are numbered sequentially in the order in which they appear. Recent *Proceedings* papers can be consulted for appropriate equation formatting. Equation (1) is an example of a numbered equation. The Reynolds number, Re, is defined as:

$$Re \equiv UL/\nu, \tag{1}$$

where U is a characteristic velocity, L is a characteristic length, and ν is the fluid kinematic viscosity.

4. Some example text

The text in this section is taken from [1]. It is included here so that the text will carry over across two more pages. There are no formatting instructions in this section.

Table 1: Engine specifications and operating conditions.

Description (units)	Value
Bore (mm)	86
Stroke (mm)	86
Connecting rod (mm)	159
Geometric compression ratio (-)	8.9
Engine speed (r/min)	1300
Intake manifold pressure (kPa)	95
Global equivalence ratio	0.2

Globally fuel-lean, stratified combustion in direct-injection spark-ignition (DISI) engines has the potential to reduce fuel consumption and carbon-dioxide emissions, compared to conventional stoichiometric homogeneous-charge engines. Issues include cycle-to-cycle variations (CCV) and criteria pollutant emissions, which require that the engine be calibrated to operate at conditions that are suboptimal for efficiency.

Spray-guided DISI (SG-DISI) engines operating in stratified mode offer additional complexities. The fuel is injected late, with appropriate timing and targeting to yield a flammable mixture at the spark plug at the time of ignition, and spark timing is limited to a narrow window after the end of injection. Exhaust-gas recirculation (EGR) may be used to control NOx, leading to even higher levels of CCV. It has been found that misfires in a SG-DISI engine correspond to cases where a flame kernel is initialized by the spark, but the kernel fails to fully develop into a propagating turbulent flame because it is advected away from the flammable mixture. Also, in the absence of in-cylinder fuel injection, in-cylinder turbulence levels increase in direct proportion to engine speed. In contrast, the turbulence level was found to increase by only 30% with a doubling of engine speed in a late-injection SG-DISI engine. This implies that the heat release associated with the main combustion event in a stratified SG-DISI engine is determined by the mixing and turbulence induced by the injection event. In-cylinder swirl has been shown to reduce variability as the engine speed is increased in a SG-DISI engine. Swirl generates a repeatable vortex near the spray centerline, which redistributes momentum, and thus reduces variability, but increases soot formation. Swirl and tumble also can lead to asymmetrical fuel distributions.

The engine is a four-valve, four-stroke-cycle, single-cylinder, optically accessible spark-ignition engine with direct in-cylinder fuel injection (Fig. 2). One intake port has a swirl-control valve that is used to modify the large-scale in-cylinder flow structure. Two of the eight spray plumes straddle the spark plug. The engine can be operated with early fuel injection, or in spray-guided stratified mode with late fuel injection.

Here a globally fuel-lean part-load stratified operating condition is considered, for which experimental results are available.

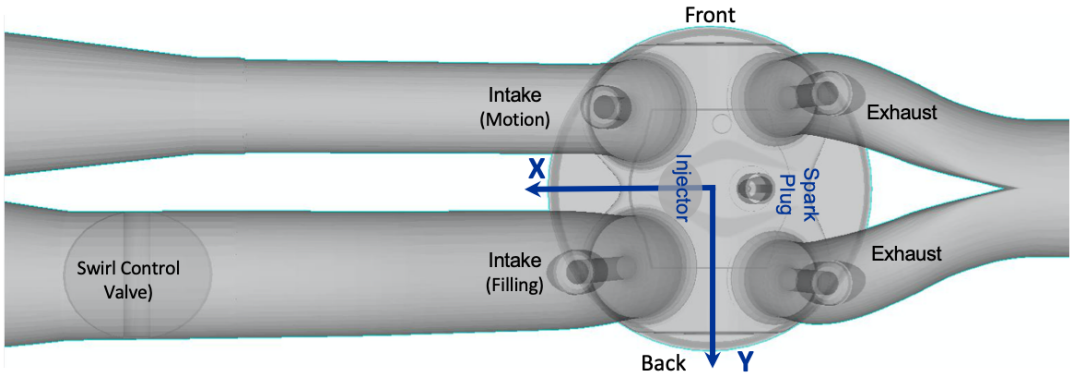


Fig. 2: Engine configuration (top view).

Table 2: Chemical mechanisms for multicomponent fuels.

First author	Fuels or molecules	# of species /# of reactions	Validation cases	Reference	Mechanism designation
O. Abianeh	TRF-Ethanol	62 / 194	LFS	[2]	A62
H. Wang	TRF-PAH	109 / 543	LFS, HCCI,DICI	[3]	W109
J.C.G. Andrae	TRF-Ethanol	143 / 672	LFS,HCCI	[4]	A143
J.C.G. Andrae	TRF-Ethanol	1121/4961	ST	[5]	A1121

5. Unnumbered sections

In the sections below, the CRediT author contribution statement, Declaration of competing interest, Acknowledgements, and References section headings are not numbered. The font and spacing are the same as those for regular section headings. The references should appear on a separate unnumbered page.

Recent *Proceedings* papers can be consulted for details concerning reference citing and formatting. The font size in the References section is 8pt with 10pt line spacing. Note that titles are to be included for journal articles. In the event that a paper is accepted for publication in the *Proceedings*, links will be added in the final published paper to directly access each of the references, where available. It is not necessary to include such links in your submitted manuscript.

CRediT authorship contribution statement

Author 1 Name: Contributions. **Author 2 Name**: Contributions. **Author 3 Name**: Contributions...

Declaration of competing interest

This is a required section, in which authors are to disclose any competing interests relating to the work reported in the paper. See Ref. [6] for Elsevier's policy. Authors will be required to complete a form related to competing interests at the time of manuscript submission. An appropriate statement in the case of no competing interests to report is given in the following paragraph.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This LaTeX template was updated from previous versions for submissions to the *Proceedings* and to the Symposium. It is based on the document that has been provided for Volume 43. Figure 1 was taken from a LaTeX template provided by Joe Oefelein for early *Proceedings* volumes. Figure 2 and Table 1 were provided by Samuel Kazmouz from Ref. [1], and Table 2 is based on a table from Jun Han's Ph.D. dissertation [7]. The contributions of numerous colleagues who have contributed to this template are gratefully acknowledged by the Editors.

References

[1] S. J. Kazmouz, D. C. Haworth, P. Lillo, V. Sick, Large-eddy simulations of a stratified-charge direct-injection spark-ignition engine: Comparison with experiment and analysis of cycle-to-cycle variations, Proc. Combust. Inst. 38 (2021) 5859–5857.

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