

Title line 1

Title line 2

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Author 1 full name^{a,*}, Author 2 full name^{a,b}, Author 3 full name^b, . . .

^a*Affiliation 1*

^b*Affiliation 2*

Continue the list of affiliations as needed, with one per line

Abstract

All text throughout is in Times New Roman font. For the purpose of estimating paper length, the formatting of this first page is not critical. Nevertheless, the fonts and line spacings that are used in a *Proceedings of the Combustion Institute* paper are specified here, for completeness. 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 39 *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). And the semicolon-separated list of keywords (below the abstract) is 8pt, left-justified, with a line spacing of 10pt. In Word, the desired line spacing can be set under Paragraph/Line Spacing using the "Exactly" option. A typical abstract will fill approximately 15-20 lines. It may appear that there is room to begin the main text at the bottom of the first page. However, in most recently published *Proceedings* papers, the front matter fills the entire first page, or very close to it. The reason is that extensive header and footer material is added in the final published papers. The intent here is that the total paper length as formatted for publication in the *Proceedings* should not exceed eight pages. Therefore, for the purpose of estimating paper length, the main text for all submissions must begin at the top of page 3, following the information that is to be provided by authors on page 2. That leaves seven full pages (pages 3-9) for the text of the paper, including references. This corresponds to an equivalent word count of approximately 6000 words, in the specified two-column format.

Keywords: Keyword 1; Keyword 2; Keyword 3; Keyword 4; . . .

*Corresponding author.

Information for Colloquium Chairs and Cochairs, Editors, and Reviewers

Note: The explanatory material in italic font on this page should be removed prior to manuscript submission.

On page 2 of their submission, authors are to provide three pieces of information: 1) a brief statement of the novelty and significance of the work reported in the manuscript; 2) a brief statement of each author's contributions to the manuscript; and 3) the authors' preference and justification for the mode of presentation at the Symposium, in the event that the manuscript is accepted for presentation. The first two of these are consistent with current requirements for publication in Combustion and Flame and other journals. The third is specific to presentation at the Symposium. This material will not be included in the published paper, in the event that the manuscript is accepted for publication in the Proceedings.

1) Novelty and Significance Statement

A "novelty and significance" paragraph is required for all manuscripts. The minimum length is 50 words and the maximum 150 words. This paragraph should provide a concise statement for editors and reviewers to use in determining whether or not the contribution warrants acceptance for presentation at the Symposium and publication in the Proceedings.

The novelty of this research is It is significant because

2) Author Contributions

The authors should be identified by their initials and each author's contributions to the manuscript should be indicated by 2-3 words such as, for example, "designed research," "performed research," "analyzed data," "wrote the paper," etc.

- First author's contributions
- Second author's contribution
- . . .

3) Authors' Preference and Justification for Mode of Presentation at the Symposium

As discussed in the information provided to authors, two formats will be available for presentation of papers at the Symposium: Oral Presentation Papers (OPPs) and Poster Presentation Papers (PPPs). Here authors are to specify their preference for OPP or PPP presentation, and to justify their preference with 3-5 highlights (<120 characters each, spaces included). The highlights should be consistent with the criteria that are given in the Criteria to Differentiate document that is available to authors. This authors' preference and justification will be considered in the decision making, although there is no guarantee that the authors' preferred mode of presentation can be accommodated. The mode of presentation for papers accepted for presentation at the Symposium will have no bearing on the decision on whether or not the submission is accepted for publication in the Proceedings.

The authors prefer **PPP/OPP** (*select one*) presentation at the Symposium, for the following reasons:

- Highlight 1
- Highlight 2
- Highlight 3
- . . .

1. Introduction

2 Start the main text at top of page 3, using two-
3 column format. The width of each column is 2.67 in
4 (67.7 mm), and the space between the two columns is
5 0.33 in (8.47 mm). Column specification details are
6 set from Layout/Columns/More Columns... As stated
7 in the Abstract, Times New Roman font is used
8 throughout. Pagewise line numbers are included, to
9 facilitate the review process.

10 The main text uses 9pt font with the line spacing
11 set to exactly 10pt, and is justified. There are 61 lines
12 per column, including headings and spaces, such that
13 the total height of each column is 8.5 in (216 mm)

14 There is no extra space between paragraphs. The
15 first line of each new paragraph is indented 0.15 in
16 (3.8 mm).

2. Sections and subsections

20 Sections are numbered sequentially using Arabic
21 numerals. Section headings are left-justified, using
22 10pt bold font, and are followed by a 10pt space.

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

2.1 Subsection heading

30 Here is subsection 2.1 text.

2.2 Another subsection heading

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

3. Figures, tables, and equations

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

47 Single-column figures (e.g., Fig. 1) should fit
48 within the 2.67 in (67.7 mm) column width. Double-
49 column figures (e.g., Fig. 2) should be sized for
50 legibility, and the image must fit within the 5.67 in
51 (144 mm) full text width. Figures are numbered
52 sequentially using Arabic numerals. Figure captions
53 are justified using 8pt font with 10pt spacing.

54 Single- and double-column tables are inserted
55 similarly. The font size throughout a table is 8pt, with
56 10pt line spacing. Table 1 is an example of a single-
57 column table, and Table 2 is an example of a double-
58 column table

59

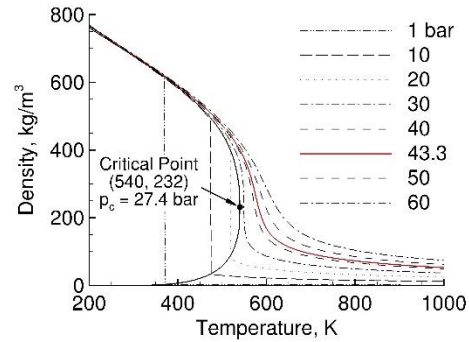


Fig. 1. Density versus temperature of n-heptane.

60

61

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

67

$$Re \equiv UL/\nu, \quad (1)$$

68

69

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

73

74 Table 1

75 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

76

4. Some example text

77

78

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

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

92 CCV have been studied extensively, using both
93 experimental and computational approaches. In the
94 case of homogeneous reactants, it has been shown that
95 the early flame development largely determines the
96 outcome of the combustion event. Most published
97 CCV work has focused on the vicinity of spark plug

1 at the time of ignition and the early flame
2 development.

3 Spray-guided DISI (SG-DISI) engines operating in
4 stratified mode offer additional complexities. The fuel
5 is injected late, with appropriate timing and targeting
6 to yield a flammable mixture at the spark plug at the
7 time of ignition, and spark timing is limited to a
8 narrow window after the end of injection. Exhaust-gas
9 recirculation (EGR) may be used to control NO_x,
10 leading to even higher levels of CCV. It has been
11 found that misfires in a SG-DISI engine correspond to
12 cases where a flame kernel is initialized by the spark,
13 but the kernel fails to fully develop into a propagating
14 turbulent flame because it is advected away from the
15 flammable mixture. Also, in the absence of in-

16 cylinder fuel injection, in-cylinder turbulence levels
17 increase in direct proportion to engine speed. In
18 contrast, the turbulence level was found to increase by
19 only 30% with a doubling of engine speed in a late-
20 injection SG-DISI engine. This implies that the heat
21 release associated with the main combustion event in
22 a stratified SG-DISI engine is determined by the
23 mixing and turbulence induced by the injection event.
24 In-cylinder swirl has been shown to reduce variability
25 as the engine speed is increased in a SG-DISI engine.
26 Swirl generates a repeatable vortex near the spray
27 centerline, which redistributes momentum, and thus
28 reduces variability, but increases soot formation.
29 Swirl and tumble also can lead to asymmetrical fuel
30 distributions.

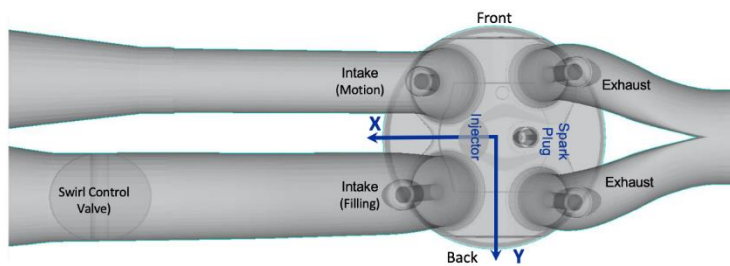


Fig. 2. Engine configuration (top view).

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

54 Here a globally fuel-lean part-load stratified
55 operating condition is considered, for which
56 experimental results over 350 consecutive cycles are
57 available. The fuel is an iso-octane/toluene blend; the
58 toluene is included to enable equivalence-ratio
59 measurements. Engine specifications and operating
60 conditions are summarized in Table 1.

62
63 Table 2

64 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

65

66

67 5. Unnumbered sections

68

69 The Declaration of competing interest,
70 Acknowledgements, Supplementary material (if
71 included), and References section headings are not
72 numbered. The font and spacing are the same as those
73 for regular section headings.

74 Recent *Proceedings* papers can be consulted for
75 details concerning reference citing and formatting.
76 The font size in the References section is 8pt with 10pt
77 line spacing. Note that titles are to be included for

78 journal articles. In the event that a paper is accepted
79 for publication in the *Proceedings*, links will be added
80 in the final published paper to directly access each of
81 the references, where available. It is not necessary to
82 include such links in your submitted manuscript.

83

84 6. Nomenclature and appendix

85

86 A nomenclature section and appendix are rarely
87 included in *Proceedings* papers, because of length
88 limitations. In the event that a nomenclature section is
89 included, it should appear before the first numbered

1 section heading under the unnumbered section
2 heading “Nomenclature.”

3 If an appendix is included, it should appear
4 immediately before the references under the
5 unnumbered section heading “Appendix.”

6 The formatting for these section headings should
7 be the same as that used for the Declaration of
8 competing interest, Acknowledgements,
9 Supplementary material, and References.

10

11 **Declaration of competing interest**

12

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

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

25

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27

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34 *Proceedings* volumes. Figure 2 and Table 1 were
35 provided by Samuel Kazmouz from [1], and Table 2
36 is based on a table from Jun Han’s Ph.D. dissertation
37 [7].

38

39 **Supplementary material**

40

41 If supplementary material is submitted along with
42 the manuscript, that should be noted here. In the event
43 that the manuscript is accepted for publication in the
44 *Proceedings*, a DOI link to the online supplementary
45 material will be included in the published paper.

46

47 **References**

48

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