Research Paper Publication -Guideline

Contents

1. What is Publication?

The noun publication comes from the Latin word publicare, meaning “make public.” Publication usually means **something is written and made available publicly**, but a company or government can submit publications of things like earnings or unemployment indexes that are communicated differently.

2. Types of Publication

Publication can be categories in two ways - on the basis of (a) Contents (b) Event

(a) Contents

- Journal Article/Paper,
- Technical Article/Paper* (literature/Scientific (all area – Social , medical etc) /Engineering or Technical),
- Letter,
- Editorial,
- White paper,
- News/Newspaper,
- Case Reports,
- Review.

(b) Events

- Event Base*- Conference/ Workshop/Symposium
- Non-event Base – Rest from above list

3. Basic Content of Article/Paper

- **Novelty** : it should be **new or novel or original**
- **Innovation : newness (innovative)** or **advancement**, **Value addition** in the filed /community
- **Unique :**not easily discovered, seen, or understood
- **Integrity :** trustworthiness of information.
- **Method :** this should cover the
- **Presentation:** It should be well well-organised manuscript**.**

Note:- Blue marked words are common with Patent criteria

4. Importance of Publication

Publishing provides a **communication channel** for researchers within a field, a **repository** of important research efforts, and a **recognition mechanism** for **researchers and institutions** alike..

- **Recognition** (Authorship)
- **Discoverability (indexing** in famous data base like Web of Science, Scopus , Google Scholar)
- **Reusability** (Standardized and detailed descriptions make research data easier to find and reuse) and
- **Awareness (** widely available to your peers and community)
- **Accessibility (** Papers/associated data are either **open** , **restricted** or **hybrid** access to readers /institutes)
- **Peer-Review Credit** (peer-review evaluates the quality/merit and completeness)
- **Citable** (google scholar citation , Research gate etc.)

5. Structure of Article/ Technical Paper (Research paper)

Generally, a technical / research paper may be 4 to 20 pages long. Accordingly, it consists of 2000 to 8000 letters. The paper formats may vary depending on different publisher (Like- SAE/ IEEE/ IMech/Elsevier/ Springer/Willey/ Inderscience etc) but it should contain below information .

1	**Title**	This should be (within 50 Words) precise but informative and striking. **Example:**- "Investigation on the Effect of Design Feature on Acoustic Performance of Exhaust Muffler for Vehicle". Informative- a. objective-investigation , b. Area of work (Product – Exhaust Muffler), c. Application- Vehicle Striking - Design feature, Acoustic performance
2	**Authors**	All the author's name with affiliation should be mentioned
3	**Key Words**	5-7 Nos of key words from the research work (**Example** (for above title) **:-** Exhaust Muffler, Backpressure, Pass by Noise, Near Exhaust Noise)
4	**Abstract**	An abstract should be comprising of objective of work (Research) , hints of Methods/ Theory used , out come /results & conclusion with clear indication of new finding . This should be commination of simple sentences which can be easily understand by readers without unconventional symbols/ acronyms/abbreviations. The length of the abstract should be within 200-300 words.

Structure of Article/ Technical Paper

5	**Introduction**	This section is a combination of general introduction of the working area/product, literature review/ survey of the same area/domain, research gaps (Present work vs literature survey) , objectives and an outline of work (last paragraph). Literature survey and research gap paragraphs of this section basically provides the view to the end readers/ peer reviewers (during review process) about the upgrade ness of author or authors in latest research on same domain.
6	**Methodology /Theory**	This section is talking about the methodology or theory . It may be design-methodology, new or modified theories or new simulation; or combination of both or all. This is completely depending on type of research/technical paper
7	**Testing/Validation Method**	This section is about testing or validation method . This may be physical (Rig level or outdoor) or digital validation. The instruments/laboratory / other relevant details (like – Data accuracy, Testing standards) should be covered in case of physical tests. Similarly, the assumptions and inputs should be properly defined for digital validation . This section may combination of both kind of validation.
8	**Results**	This section is out come of previous section in tabular , graphical or other suitable representation with short write up about those.
9	**Discussion**	This is basically describing of previous section outcome in details with theoretical or other co-relation (like with literature survey) .

Structure of Article/ Technical Paper

10	**Conclusion**	This should be summary of all finding from the research work . It should be expressed point by point looking at results & discussions. Also, it is recommended (not mandatory) to indicate the value addition to the field or future scope of work.
11*	**Acknowledgement**	This section is to show the gratitude to the persons/ organizations/ institutes /departments who help for the research work and publication (by funding/ consultation/resource allocating/ permission granting etc)
12	**Reference**	This is for enlisting all the Books, Journals, Conference papers, Standards, Web reference information etc. used for the research work . This references are mentioned in literature review/survey section under Introduction. Also, some reference specially for testing standards are mentioned in "Testing / Validation Method". There are guidelines available for each publishing house to represent the different kind of references in article/ Technical paper.
13	**Abbreviations/ Acronyms/ /Symbols**	As name suggested , this covers all **Abbreviations/ Acronyms/ /Symbols** used in Technical Paper/ Article.
14*	**Appendix**	This section is for add-on space to represent some important information/ Table/ Equation Source/ Charts/Graphs. This is to ensure no discontinuation of paper/article in terms of presentably and information integrity.

Note:- a. * These are not mandatory b. Refer the example

Structure of Article/ Technical Paper (Example- SAE Paper)

2020-28-0478 Published 25 Sep 2020

Experimental Investigation on the Effect of Shell Design on Noise Quality and Performance of an Automotive Exhaust Muffler

Sanjoy Biswas Tata Motors Ltd.

Citation: Biswas, S., "Experimental Investigation on the Effect of Shell Design on Noise Quality and Performance of an Automotive Exhaust Muffler," SAE Technical Paper 2020-28-0478, 2020, doi:10.4271/2020-28-0478.

Abstract

This research paper is dealing with development of a Hybrid Exhaust muffler with four different shell configurations (Internal design unaltered) and investigated the impact on noise performance and quality (perceived). Noise performance has been evaluated by measurement of Pass by Noise and near exhaust noise Level on a typical 16T -6-speeds transmission Truck. The experimental activity conducted based on DOE approach. From this study, it observed single shell with lower thickness have the poor NVH performance and perceived quality as well. Shell or booming noise is also observed with this configuration. Double shell with Ceramic blanket (throughout the length) sandwich configuration exhibited the best performance though this design is most expensive among the four mufflers. Remaining two Configurations (i.e. - Single shell of higher thickness and Double shell with Ceramic blanket only around reactive chamber) displayed at per results in both perceived noise quality and Noise performance. There are difference around 0.6 dBA noise at 3rd and 4th Gear Pass by Noise (PBN) level among best and poor performing Shell configuration muffler. The experimental research has revealed the importance of Shell Configuration/Design on acoustic/NVH performance and Noise (perceived) Quality of muffler as well at Vehicle Level.

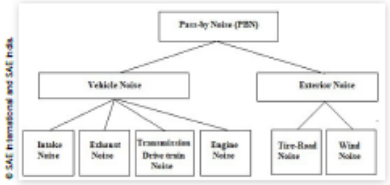
Keywords

Hybrid muffler, DoE, Sound Quality, Acoustic, Shell Design, Pass by Noise, Near Exhaust Noise,

Introduction

To attenuate engine out exhaust noise, it is important to use of muffler or silencer. It is quite higher than other noise sources of vehicle. Hence, an exhaust muffler is the main device of any automotive exhaust for noise reduction. To evaluate the performance of any muffler, key metrics are the insertion loss and backpressure. Backpressure is the pressure drop through the exhaust system. It is the difference between the pressure at exhaust manifold and the atmospheric pressure. Backpressure is a parasitic loss, which impact on engine power and fuel consumption. In general, pass by Noise (PBN) and in-cab Noise (ICN) results are the outcome to assess the Noise vibration harshness (NVH) Performance of any vehicle. Through PBN (Refer Fig. 1) and ICN, acoustic performance of muffler are evaluated indirectly, which are linked with several other elements like Engine combustion/ Radiated noise (CN), Piston slap noise, Fan belt noise, Intake noise, Transmission/Drive-train noise, Tire-road noise, insulation/ heat shielding. There are many parameters to design of good muffler for vehicle or engine. The primary design factors are starting from Muffler Volume Selection to Expansion Ratio optimization, Shell design, Inside Chamber

FIGURE 1 Pass by Noise decomposition [redrawn in reference [1]]



length finalization / Baffle positioning, Chamber insider configuration, perforation pattern, Perforation percentage, dissipative/absorptive chamber design, absorptive material selection and quantity. On other hand, secondary factors like structural rigidity/durability, Shape, size, weight, cost, assembly, serviceability/accessibility and manufacturability are also important. Each primary design parameters has the

effect on acoustic performance [insertion loss (IL), transmission Loss (TL) and Noise reduction (NR)] of muffler at individual as well as final vehicle level NVH.

Many research works happened for design of good muffler for prediction of insertion loss, Transmission loss, optimization through DOE and DFSS, prediction of backpressure, acoustic of exhaust and design methodology [1, 2, 3 and 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]. Importance of Robust engineering to meet customer expectation is equally applicable for automotive products [4, 5] and it is used by numerous research for muffler development [6, 7, 8, 9].

For optimization of TL performance of suction muffler, Gosavi et al. [6] used L8 orthogonal array of Taguchi DOE matrix. Ni Jimini et al. [7] have optimized the design of car muffler to reduce noise of Tail Pipe using DOE. These [6, 7] works are based on both software analysis as well as experimentation. In earlier work, authors [9] developed a robust three-chamber hybrid muffler for heavy commercial vehicle following the five steps (I-D-D-O-V) approach of design for six sigma (DFSS). This paper also deals with various aspects of muffler design technique and effective of DFSS process.

Chen et al. [10] have discussed various methodologies of muffler volume determination to achieve good Insertion Loss in their study. Shah et al. [11] have emphasized on 7-steps practical methodology from the concept design level to prototype making and testing validation of exhaust muffler along with optimization approach between backpressure and noise using CAE tools. According to them, this approach will help to better understanding and reduce the number of iterations, which may reduce lead-time of product development and cost as well.

In his work, Elsaadany [12] has characterized and simulated the acoustic performance of different types of exhaust filters. In addition, optimization approach demonstrated for different muffler configurations in this work. Lota M S et al. [13] worked on prediction of backpressure of an automotive two-chamber muffler with internal tubing and separated by a perforated baffle, using CFD simulation. Similarly, Takashi et al. [14] have established a one dimensional CFD model to predict tail pipe noise and validated the predicted data with experimental results. They found good agreement among prediction and test data, which is help full for designing of good muffler with Tail pipe.

ML Munjal [15] has developed an analytical model for prediction of transverse TL of sandwich shell along with parametric study. He found, replacement of single layer shell by Sandwich shell (refer Fig. 1) can reduce the breakout noise and it will reduce by increasing the thickness from inner to outer layer. Optimum design achievable with higher or equal transverse IL than axial IL.

Through simplified BEM approach, exhaust source modeled in terms of volume velocity and impedance by Yadav et al. [16]. They have established a good correlation of SPL at low frequency region where exhaust noise is dominant in nature to help to reduce design cycle time.

Present research wok is dealing with development of a hybrid or combination muffler with four different shell configurations (Refer Fig. 2) to study the impact of it on noise performance and perceived noise quality. The internal configuration is same for all these four variants (Refer Table 2) of muffler.

FIGURE 2 Shell Configuration of Muffler/ Silencer

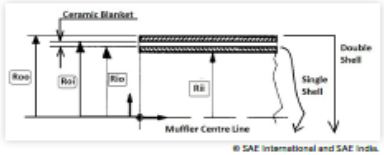
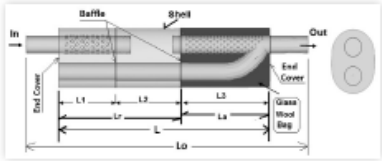


FIGURE 3 Hybrid Exhaust Muffler



Using DOE approach, all factors and experimental combinations are represented methodically in this study. The muffler has three chambers, which are separated with two perforated baffles along with tubing connection. First two chambers are reactive and last chamber is dissipative/absorptive in nature for noise attenuation. Fig. 3 shows the internal configuration of proposed muffler where length of three chambers are indicated by L1, L2 & L3 (La) respectively. From the experimental results and graphs based on DOE methodology, new finding from this research work established.

Design Methodology

Its Transmission Loss (TL) and Insertion Loss (IL) assess noise attenuation capability of any silence / muffler along with backpressure. An engineering tradeoff between noise attenuation and backpressure is essential for design of good muffler. Better noise attenuation capability effects in a higher level of backpressure, which is again unfavorable to engine performance. Backpressure is a kind of parasitic loss, which may reduce engine power and increase fuel consumption (brake specific fuel consumption).

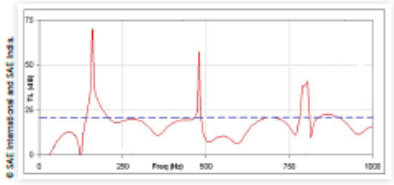
Transmission Loss Calculation

TL is a property of the muffler. Transmission loss is the difference between the sound-pressure-level (SPL) incident on the muffler and the transmitted downstream into anechoic termination. TL has been evaluated for the muffler configuration shown in Fig. 2 using Sys-Noise software.

TABLE 1 Input for Sys-noise for TL evaluation

Glass wool Material density (gm/lit)	Air Flow resistivity (Rayls/m)	Porosity (%)	Selected Temp (°C)	Speed of Sound @ selected temp(m/s)	Air Density @selected temp(kg/m³)
120	5554	99	400	570	0.523

FIGURE 4 TL analysis of Muffler



Sys-Noise is one of effective computational Vibro-Acoustics tools wide used for optimization or predication of acoustic performance of muffler / duct/Filters. This is based on FEM meshing and flow field is stationary, inviscid and irrotational type. The inputs for this analysis are represented in Table 1. In this analysis, fluid flow is consider as homogenous and transient. The TL analysis done considering rigid shell. Fig. 4 is showing the TL vs Frequency graph of proposed muffler. From this Sys-Noise graph, analysis, it observed that the mufflers TL is around 22 dB

Insertion Loss Calculation

Insertion loss (IL) is the difference between acoustic powers radiated without the muffler and that with the muffler. Generally, first step of any muffler design start with determination of muffler volume in reference to applicable Engine/ vehicle. It is related to insertion loss and engine power. Principally, Insertion loss is proportionate to volume ratio (Vm/VP). The muffler considered for this work is hybrid or combination type where both reactive and dissipative/absorptive noise attenuation principle coexists. Muffler Volume (Vm) is combination of Vr (Reactive Chamber Volume) and Va (Dissipative Chamber Volume).

For this muffler Vm= 44.97L [10],
Engine Volume Vp= 5.9L
Vm/Vp = 7.62
According to Munjal [2], IL = 20.05 dBA

Backpressure is not the scope of this research work and hence, it is not discuss. The present work is primarily deals with the influence of shell configuration on Noise attenuation performance and Shell has no impact on backpressure. Internal configuration is same for all four variants of shell or muffler.

Experimental Procedure

The noise performance measurement activity done based on IS: 3028 [17] and IS: 10399 [18]. These two standards are deals with noise measurement methodology of running and stationary vehicle respectively. The Typical Truck used for this trial is 4x2 -16 Tonner which has 180 hp heavy diesel engine, 6-Speed Manual Transmission, 10x20 size Tires, and non -sleeper fixed cabin. For PBN Trial proper gear section is one of important requirement.

Figure 5 is representing the PBN and NEN testing schematic based on reference [17, 18] where microphone / sound level meter position indicated. In case of NEN tests, vehicle will be remain in stationary condition. During PBN trial, Vehicle will be run in which gears depends on number of speeds (or Forward Gears) in Transmission/Gearbox. Rear Axle Ratio, Tiers specification and engine calibration (applicable for electronic control engine) also plays vital role to decide the worst-case criteria of PBN trial.

Table 2 is representing the inputs for DOE Matrix of PBN in tabular form. In this table, Double shell 2(S4) is indicating the sandwich shell where 1 mm thick ceramic blanket is used in entire silencer length in between inner and outer shell of 1 mm thickness [9]. Likewise, same thickness smaller size ceramic blanket is used around the reactive chamber zone (length Lr - Refer Fig. 2) only in double shell 1 (S3) configuration. G1, G2 and G3 are the gears that has to choose from vehicle drivetrain as per IS: 3028 standard [17]. Shell thickness varies only for single shell mufflers (i.e. - S1 and S2). Based on

FIGURE 5 Schematic diagram of noise testing-(a) Pass by noise test track; (b) Near Exhaust Noise test

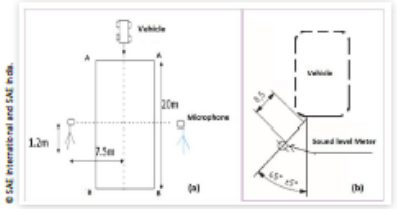


TABLE 2 DOE matrix for PBN -factors, Level and Value.

Factors	Level	Value
Single shell 1	S1	1 mm thick
Single shell 2	S2	1.6 mm thick
Double shell 1	S3	sandwich shell with 1 mm thick ceramic blanket Partially
Double shell 2	S4	sandwich shell with 1 mm thick ceramic blanket fully [9]
Gear 1	G1	3rd Gear
Gear 2	G2	4th Gear
Gear 3	G3	5th Gear

Structure of Article/ Technical Paper (Example- SAE Paper)

TABLE 3 DOE Table for Pass by Noise measurement

		Gears			Pass by Noise level (Average)
		G1	G2	G3	$\frac{1}{n}\sum_{j=1}^{n} S_i G_j$
Shell Configuration	S1	S1G1	S1G2	S1G3	S1G
	S2	S2G1	S2G2	S2G3	S2G
	S3	S3G1	S3G2	S3G3	S3G
	S4	S4G1	S4G2	S4G3	S4G

TABLE 4 Test Combination for Near Exhaust noise.

Factors		Factor value	Condition
1	Single shell 1 (1 mm thick)	S1	WOT
2	Single shell 2 (1.6 mm thick)	S2	WOT
3	Double shell 1 (Partial Ceramic Blanket)	S3	WOT
4	Double shell 2 (Full ceramic Blanket)	S4	WOT
5	Without Muffler	S0	WOT

the inputs given in table 2, below DOE Table for PBN measurement has been formed.

In table 3, I and J are representing the shell configuration numbers and gears numbers respectively.

Also, the equation $\frac{1}{n}\sum_{j=1}^{n} S_i G_j$ is indicating the average pass by noise for any shell configuration muffler.

Here, all the trials done under static condition as per IS: 10399 [18] at wide open throttle (WOT).

Results and Discussions

This section is dealing with all Experimental results as per the DOE table shown in previous section in tabulated and graphical format for better understanding. Pass by Noise (PBN) and Near Exhaust Noise (NEN) are the evaluation criteria of performance, as shell configuration has no impact on backpressure value.

PBN and NEN Comparison

This analysis consists of two experiments as per DOE table namely pass by noise (PBN) tests and near exhaust noise (NEN) tests respectively. All these test results are represented below in tabulated and graphical form successively.

This table is showing the test results of pass by noise. Here, Speeds at position A A' and BB' are finalized based on IS: 3028 for the typical vehicle. Values of Column 7 (table 5) is the average of mean PBN considering all Gears (i.e.- G1, G2 and G3) for any particular shell configuration muffler. Fig. 6 is the representation of average PBN for each shell configuration muffler in Bar-Chart form for summarization of results.

TABLE 5 Vehicle Pass by Noise (PBN) tests

Trial	Vehicle Speed (km/h)		Pass by Noise level (dBA)			Average PBN(dBA)
	AA'	BB'	LH	RH	Mean	
S1G1	20	30	79.7	80.3	80.1	79.8
S1G2	30	38	79.8	80.3	80	
S1G3	40	45	79.1	79.5	79.3	
S2G1	20	30	79.5	80.1	79.8	79.6
S2G2	30	38	79.5	79.9	79.7	
S2G3	40	45	79.1	79.5	79.3	
S3G1	20	30	79.5	79.9	79.7	79.4
S3G2	30	38	79.4	79.8	79.6	
S3G3	40	45	78.6	79.2	78.9	
S4G1	20	30	79.2	79.6	79.4	79.2
S4G2	30	38	79.3	79.5	79.4	
S4G3	40	45	78.7	79.1	78.8	

FIGURE 6 Pass by Noise results Comparison

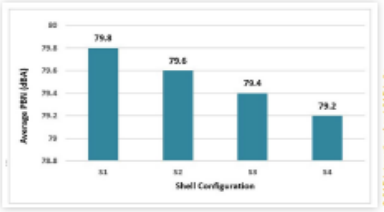


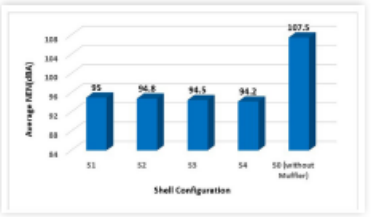
TABLE 6 Near Exhaust Noise (NEN) tests at WOT

Trial	Near Noise level (dBA)		Average NEN(dBA)
	LH	RH	
S1	94.2	95.8	95
S2	94.4	95.4	94.8
S3	94	95	94.5
S4	93.7	94.7	94.2
S0	107.1	107.9	107.5

From Table 5 and Fig. 6, it is clear that shell configuration 4 (S4) is best whereas shell configuration 1 (S1) is worst in PBN performance.

Table 6 is displaying the test results of Near exhaust noise as per IS: 10399 guideline. Fig. 7 is the summarized representation of average NEN for each shell configuration muffler in Bar-Chart format. Similar to the PBN, it is quite clear that shell configuration 4 (S4) is best whereas shell configuration 1 (S1) is worst in NEN performance from Table 6 and Fig. 7. Here, one of key observation is that the NEN performance of S2 is inferior by 0.3 dBA with respect to S3 muffler.

FIGURE 7 Near Exhaust Noise results Comparison



Perceived Noise Quality Comparison

Only meeting the regulatory Pass by Noise (PBN) norms may not be adequate to illustrate the impact on sound inside cabin or inside the car. Sound Quality assessment is one of most popular approach especially for passenger vehicle or Car. This approach has limited application in commercial vehicle. The Sound Quality of any product is define by an Annoyance Index, which is combination of both subjective and objective evaluations.

$$\text{Annoyance Index} = f(N,R,S,T) \quad (1)$$

Where, N, R, S, T are loudness, Roughness, Sharpness and tonality respectively

The matrices N, R, S, T and Articulation Index (AI) are used for evaluation of sound quality. Further, AI is function of sound pressure level (SPL) and Speed or Time.

Application of this type of muffler is for heavy commercial vehicle and hence, only subjective evaluation done for sound quality. NVH test engineers have done the subjective evaluation of sound quality of all four mufflers based on Vehicle evaluation scale shown in Appendix-A. They found presence of Booming noise with different level of evaluation rating/Scale for these mufflers. In general, Booming noise is an unpleasant sound due to the low frequency resonance of the component itself (e.g.- Powertrain, Exhaust, Intake, car body etc.) connected with compartment acoustic modes. It witness during sudden acceleration/ Run up or run down to low rpm of engine operating condition. Frequency range various within 20-250Hz for Booming Noise. Generally, Booming Sound quality is related to the sharpness and loudness of interior sound.

TABLE 7 Noise Quality Evaluation (Subjective).

Sr No	Muffler	Rating	Scale
1	Single shell 1 (S1)	Poor	4
2	Single shell 2 (S2)	Acceptable	6
3	Double shell 1 (S3)	Good	8
4	Double shell 2 (S4)	Very Good	9

Accordingly,

$$\text{Booming Noise} = f(N,S) \quad (2)$$

From the subjective evaluation results, it observed that double shell configuration with fully ceramic blanket inside (S4) exhibited best performance in noise quality as well. On other hand, single shell muffler with lower thickness (S1) is poor among the mufflers.

Conclusions

This experimental research work deals with development of four different sell configuration /design hybrid muffler for automotive application to investigate the impact of it on acoustic/NVH performance and perceived noise quality. This study gives the following insights

- Shell Configuration/ Design has impact on acoustic performance (IL and TL).
- Shell design/Configuration has impact on end performance of vehicle NVH (i.e.- Pass by Noise and Near Exhaust Noise). It also influence Sound (perceived) quality of muffler.
- Double Shell 2 [S4] (Sandwich shell with 1 mm thick ceramic blanket trough out the muffler body length) configuration is most effective in Noise Performance whereas low thick single shell [S1] is worst among the configuration. S4 is superior by around 0.6 dBA (average) noise reduction than S1 in PBN. In case of Near Exhaust Noise, S1 is inferior to S4 by 0.8 dBA.
- PBN performance is at per for both Single Shell with higher thickness [S2] and Double Shell with partial Ceramic Blanket [S3]. Though 0.3 dBA difference observed in Near Exhaust Noise tests among these configurations [S2, S3].
- Single Shell with lower thickness [S1] is worst in Sound (perceived) compared to other three mufflers [S2,S3,S4]. Noticeable Shell out noise or Booming noise observed with this configuration in subjective sound quality evaluation. Double shell with full body ceramic blanket [S4] configuration is best among the mufflers. Although, Double shell with zonal ceramic blanket [S1] arrangement is also good in perceived noise quality and it is the 2nd best.
- Single Shell with higher thickness [S2] and Double Shell with Zonal Ceramic Blanket [S3] are optimistic design. These designs can be adopt for the vehicle based on application demand.
- IL Value found around 12.5-13.3 dBA where as calculated value for simplest design (i.e. Single Shell with higher thickness) is 20.05 dBA. This indicates yet to improve the predictive model to get around 90% accuracy with physical data.

Lastly, it can be conclude that this work could be based level guideline to the designer/engineer during designing any exhaust muffler for automotive application.

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Definitions/Abbreviations

DFSS - Design for Six Sigma
DOE - Design of Experiment
FEM - Finite Element Method
WOT - Wide open Throttle
PBN - Pass by Noise
ICN - In Cab Noise
NEN - Near Exhaust Noise
IL - Insertion Loss
TL - Transmission Loss
NR - Noise Reduction
dBA - Decibel A-weighting
Vp - Swept Volume/ Engine Volume
Vm - Muffler Volume (Total)
Vr - Reactive chamber volume (Total)
Va - Absorptive chamber volume (total)
n - No of cylinder; No of response
L1 - Reactive chamber 1- Length
L2 - Reactive chamber 2- Length
Lr - Reactive chamber Length (Total)
La or L3 - Absorptive chamber length (total)
L - Overall Length of Muffler body
Lo - Overall of Length of muffler
Rii - Radius of inner shell inside
Rio - Radius of inner shell outside
Roi - Radius of outer shell inside
Roo - Radius of outer shell outside
SPL - Sound pressure Level
N - Loudness
R - Roughness
S - Sharpness
T - Tonality
AI - Articulation Index

6. Publication Process

The Article/Technical paper publication process is shown below

Non –event Base- Journal

- Step1: •Authors details , Bio updation in web site
- Step 2: •Manuscript Submission
- Step 3: •Manuscript (Full length paper / Article) Peer-review – Min 3 reviewers • Decision (R/AC/ A)
- Step 4: •Manuscript Review Feedback (R/AC/ A)- In case of R, Loop close
- Step 5: •Revised Manuscript Submission
- Step 6: •Revised Manuscript review /Peer-Review
- Step 7: • Revised Manuscript review feedback – •Decision (R/AC/A) , In Case A , Follow Next Steps
- Step 8: • Copy Right , Camera ready Manuscript ,
- Step 9: • Proof ready copy review and ok feedback
- Step 10: •Paper publish in Global Data base with indexing

Org Review

Org Review

Event Base- Conference/Symposium

- Step 1: •Abstract Submission in event website
- Step2: •Abstract review
- Step 3: •Abstract review feedback (Y/ N) •Manuscript submission request (if Y)
- Step 4: •Manuscript Submission
- Step 5: •Manuscript (Full length paper / Article) Peer-review – Min 2 reviewers • Decision (R/AC/ A)
- Step 6: •Manuscript Review Feedback (R/AC/ A)- In case of R, Loop close
- Step 7: •Revised Manuscript Submission
- Step 8: •Revised Manuscript review/Peer-Review
- Step 9: • Revised Manuscript review feedback – •Decision (R/AC/A) , In Case A , Follow Next Steps
- Step 10: • Copy Right , Camera ready Manuscript , Presentation File , Authors Bio Submission
- Step 11: • Participation in event and presentation, Paper publish in proceeding
- Step 12: •Paper publish in Global Data base with indexing

7. What is Peer-review ?

Peer review is **designed to assess the validity, quality and often the originality of articles for publication**. Its ultimate purpose is to maintain the integrity of science by filtering out invalid or poor-quality articles.

FAQ of Peer-Review ?

What is the Role of a Peer Reviewer ?

Peer review **provides authors with the opportunity to improve the quality and clarity of their manuscripts**. It also guides the journal's editorial staff in making publication decisions and identifying substandard manuscripts that should not be published.

Why is it called peer review?

A peer-reviewed publication is also sometimes referred to as a **scholarly publication**. The peer-review process subjects an author's scholarly work, research, or ideas to the scrutiny of others who are experts in the same field (peers) and is considered necessary to ensure academic scientific quality.

Who can be a peer reviewer?

Anybody (have **subject matter expertise** in that field/area/domain) who does **not have a competing interest** can be nominated as peer-reviewer

Types of Peer Review?

The three most common types of peer-review process are as below –

a. *Single Blind /Single-anonymized Peer Review-* Authors unaware about reviewers
b. *Double Blind / Double-anonymized Peer Review-* both authors and reviewers unaware about each other
c. *Open Peer Review-* both the party knew each other during review process

8. What is indexing of Research Paper/Journal ?

*Indexation of a journal is considered **a reflection of its quality**. Indexed journals are of higher **scientific quality** as compared to non-indexed journals.*

What is index terms in research paper?

In information retrieval, an index term (also known as subject term, subject heading, descriptor, or keyword) is **a term that captures the essence of the topic of a document**. Index terms make up a controlled vocabulary for use in bibliographic records.

What is Impact Factor ?; Why use it?

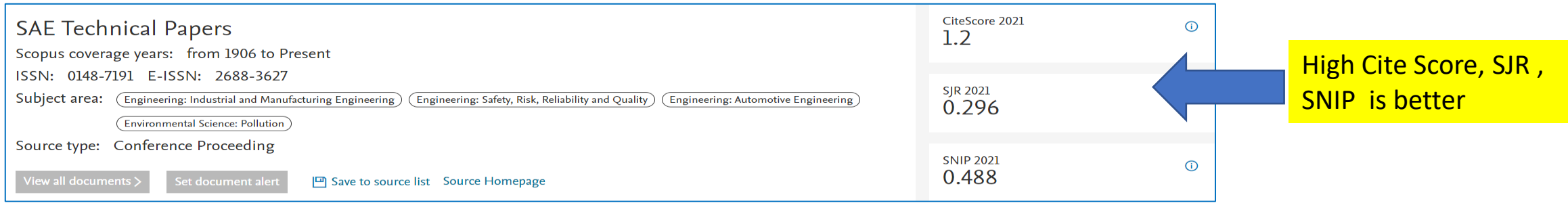
The **impact factor (IF)** is a measure of the frequency with which the average article in a journal has been cited in a particular year. It is used to measure the importance or rank of a journal by calculating the times its articles are cited.

Example of Abstracting & indexing

- Web of Science (e.g.- Science Citation Index(SCI), SCIE, ESCI [https://mjl.clarivate.com/search-results])
- Scopus [https://www.scopus.com/sources.uri?zone=TopNavBar&origin=searchbasic]
- Academic Search (EBSCO)
- Current Abstracts (EBSCO)

Note:- To check the Journal Indexing either –Subject or Title or ISSN / eISSN input to be given during query .

Example :- **Scopus indexing**



Example :- **WOS indexing**

Higher JCR is better .

JCR covers both Journal Impact factor (JIF) and Journal Citation Indicator (JIC)

PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING

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Journal Citation Report™ (JCR)

Journal Citation Reports™ 2022

Journal Impact Factor™ (JIF) — JCR SUBSCRIPTION NOT ACTIVE

2021	2020
Not seeing a JIF? A JCR subscription is required to view the JIF for this journal. If this is an error, please use the "Check Subscription Status" button to contact support.	Not seeing a JIF? A JCR subscription is required to view the JIF for this journal. If this is an error, please use the "Check Subscription Status" button to contact support.
Categories: Engineering, Mechanical | Transportation Science & Technology	**Categories:** Engineering, Mechanical | Transportation Science & Technology

Journal Citation Indicator (JCI) — NEW METRIC

The Journal Citation Indicator is a measure of the average Category Normalized Citation Impact (CNCI) of citable items (articles & reviews) published by a journal over a recent three year period. It is used to help you evaluate journals based on other metrics besides the Journal Impact Factor (JIF).

2021	2020
0.41	0.37
Categories: Engineering, Mechanical | Transportation Science & Technology	**Categories:** Engineering, Mechanical | Transportation Science & Technology

9. Importance of Indexing

Having indexes **allows researchers to more quickly find records for specific individuals**; without them, researchers might have to look through hundreds or thousands of records to locate an individual record. It also represents a number referring to a list of terms, definitions, topics etc.

*Publishing of paper in good indexed Journal (or Publishing organization) provides an **identity** to researchers within a field, among the research (both academic & industry) community and gives **recognition**.*

Google Scholar :- (Example- https://scholar.google.co.in/citations?user=6355FFsAAAAJ&hl=en)

Research Gate :- (Example- https://www.researchgate.net/profile/Sanjoy-Biswas-4)

ORCID :- (Example - https://orcid.org/0000-0002-3830-6561)

Publishing Organization Data base :- [Example- (1) IEEE - https://ieeexplore.ieee.org/document/5714857

(2) SAE - http://profiles.sae.org/sanjoy_biswas/]

10. Key Publication Sites

SAE	https://www.sae.org/ Publish Books, Journals, Technical Paper (Event –base), Technical Paper (Without-Event) Magazine, Technical Standards https://www.sae.org/publications/journals ; https://www.sae.org/attend https://www.sae.org/attend/calls-for-papers https://www.sae.org/participate/volunteer/author/nonevent-technical-papers https://www.sae.org/participate/volunteer/author/event-paper-process (Popular Journals- SAE International Journal of Engines, SAE International Journal of Commercial Vehicles)
IEEE	https://www.ieee.org/ Publish Books, Journals, Conference Paper (event –base), Magazine, Technical Standards https://www.ieee.org/conferences/index.html https://www.ieee.org/publications/index.html https://journals.ieeeauthorcenter.ieee.org/create-your-ieee-journal-article/authoring-tools-and-templates/tools-for-ieee-authors/find-a-journal/ (Popular journals – IEEE Journal of Vehicular Technology)
IMech (Saga)	https://uk.sagepub.com/en-gb/eur/imeche Publish Books, Journals, Magazine (Popular Journals- Part C: Journal of Mechanical Engineering Science; Part D: Journal of Automobile Engineering ; Part O: Journal of Risk and Reliability ; International Journal of Engine Research)
Springer	https://link.springer.com/ Publish Books, Journals, Conference Paper (book chapter form), Magazine https://link.springer.com/journals/a/1 (Popular journals – Flow, Turbulence and Combustion; International Journal of Automotive Technology, Automotive Innovation)
Elsevier	https://www.elsevier.com/en-in Publish Books, Journals, Conference Paper (event –base), Magazine https://www.elsevier.com/solutions/sciencedirect/journals (Popular journals – Applied Energy, Progress in Energy and Combustion Science, Applied Acoustics, Applied Thermal Engg.)

Wiley	https://onlinelibrary.wiley.com/ Publish Books, Journals, (Popular Journals- Energy Science & Engineering, Energy Storage , Advanced Material)
IOPscience	https://iopscience.iop.org/journalList Publish Books, Journals, Conference Paper (event –base), Magazine (Popular journals – Journal of Physics: Conference Series, Measurement Science and Technology, Journal of Physics D: Applied Physics.)
Inderscience Publishing	https://www.inderscience.com/ Publish Books, Journals, Magazine and conference paper (Popular Journals- International Journal of Vehicle Design; International Journal of Vehicle Noise and Vibration)
Taylor & Francis	https://www.tandfonline.com/ Publish Books, Journals, Conference Paper (event –base), Magazine https://link.springer.com/journals/a/1 (Popular journals – Combustion Science and Technology; Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, International Journal of Ambient Energy)
Nature	https://www.nature.com/ Publish Books, Journals, (Popular journals –Nature Material , Nature Energy)
ASME	https://journaltool.asme.org/home/index.cfm Publish Books, Journals, Conference Paper (event –base), Magazine, Tutorial , Standards (Popular journals – Mechanical Design , Heat & Mass transfer, Vibration and acoustics, Fuel cell Science and Technology)
MDPI	https://www.mdpi.com/ Publish open access journals ; (Popular Journals- Energies , Materials, Nano Materials, applied Science)
Hindwai	https://www.hindawi.com/ Publish open access journals ; https://www.hindawi.com/journals/ (Popular journals –Journal of Combustion, Journal of Energy; Modelling and Simulation in Engineering)

11. FAQ

1.Who can be an author ?

Anyone who is the contributor of research work and interested to publish the work with due permission from the institute/organization.

2. Is Publication fees required?

It depends on publication type and author's interest. Generally, *Article processing fees (more generically called as Publication fees) required for event base publication like conference /symposium etc and for open access journals*. Also, many authors wish to publish the work in open access journal for wide distribution of their work and citation. Some publishing organization like SAE provides different benefit to the authors for publication subject to have the membership. *Major scholarly publication is restricted type where no article processing fees required. It is mainly relied on merit/ impact/quality of paper*.

3. What is Open access, Hybrid, and restricted publication?

Open access:- The article/research paper is widely accessible to readers as well as authors worldwide without any charges whereases authors or their institutes/organizations will borrow the article processing fees.

Restricted :- The publisher bears the article processing charges. It is restricted for readers for free access. Authors will get a copy of it.

Hybrid access :- Both restricted and open access papers /articles are published in same Volume or Issue of Journal.

All these are indicated using symbols beside the title of paper of any Journal Volume /issue

4. What contents can be disclosed in Paper?

The generic form of data/ information /results can be presented in technical papers/Articles if you are part of R&D of any organization. It should not cover any product /brand name or futuristic works align with confidential product Road map or business strategy. In case of any Work is suitable for IPR/Patent then, it is recommended to submit the paper after completion of IPR /Patent Filling.

5. Why Organization approval is mandatory ?

This is for filtration to pass any confidential information to open forum intentionally or unintentionally. The authorized team will audit, guide and provide consent.

6. What should be the preliminary check to choose any Event (Conference etc) or Journal for publishing Paper ?

Generally , following parameter can be check before submitting any paper – a. Reputation of publishing house/organization, b. **Impact factor** of Technical paper/Journals **(** Refer - https://researchguides.uic.edu/if/impact ; https://www.scopus.com/sources.uri?zone=TopNavBar&origin=searchbasic & https://mjl.clarivate.com/search-results **)** c. Publication Timeline and d. article processing charge (if any)

7.What Plagiarism ?

It is indicating "the practice of taking someone else's work or ideas and passing them off as one's own" or copying. The University defines plagiarism as follows: "***Presenting work or ideas from another source as your own, with or without consent of the original author, by incorporating it into your work without full acknowledgement.***

8. What % Plagiarism acceptable?

It depends on publication housing (Publisher) / University/ Insititute and types of Publication. Generally, maximum 5-10% plagiarism is acceptable depending of type of publication .

9. What will happen with unacceptable Plagiarism ?

Rejection of Manuscript/Paper:- The publishing house can directly reject without review after preliminary plagiarism

Legal issues :- Exceptional cases, new publisher may publish the contents without proper evaluation of Plagiarism with copyright agreement (Stating authors are responsible for all contents/ information) . Original owner can file legal notice and go for court case.

10. How to check Plagiarism ?

Using the **Plagiarism Cheker Software ,** authors can proactively check their **manuscript /article/ document /thesis**. Below are the few **Plagiarism Cheker Software** name which can be used

Turnitin: Empower Students to Do Their Best, Original Work (https://www.turnitin.com)

iThenticate: Plagiarism Detection Software

Grammarly (https://www.grammarly.com › plagiarism › checke)

Small SEO Tools (https://smallseotools.com › plagiarism-checker)

Thank You