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# ACOUSTIC DESIGN OPTIMIZATION OF CLOSE-FITTING ENCLOSURE USING GENETIC ALGORITHM TOOL FOR DIESEL POWER GENERATOR SOUNDPROOFING APPLICATION

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Dissertation submitted in partial fulfillment of the requirements for the degree  
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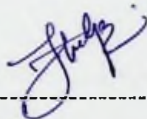
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## **ABSTRACT**

Reciprocating engine power generator sets produce uncomfortably loud noise when it is in operation. Installation of Power Generator (PG) shall comply with local noise regulations. Further price, space and weight ensure a commercially appealing product in PG market. However in Sri Lanka most of the locally fabricated soundproof PGs has failed to meet SPL regulations even though it is in reasonable low price compared with imported soundproof PG. Open discussion about this problem with the local PG suppliers revealed that, absence of simple and fast acoustic enclosure design procedure customized with the SPL spectrum of open PG and the customer requirement of space, weight and cost has created this problem.

Close-fitting enclosure fabricated with sheet metal enclosure face insulated with sound absorption materials is method of Passive Noise Controlling (PNC) used in PG soundproofing. SPL model of soundproof PG was developed considering Insertion Loss (IL) of the enclosure and SPL spectrum of the open PG. The model was constrained for customer required SPL, cost and weigh. Effective deign variables of the model were identified and developed an optimization code for selecting optimum minimum values for the identified variables using Genetic Algorithm (GA) optimization tool in MATLAB. Optimization were converted to user friendly deign application through a Graphical User Interface (GUI).

Validity of the developed design methodology was done by comparing the model predicted data with manufacturer given data for selected set of "Cummins" power generators. After that design variables were predicted for open type standby power 22kVA "Cummins" PG with 75% load at 3m distance and the acoustic enclosure for the model was fabricated accordingly. SPL measurement of fabricated enclosure realized the developed methodology is substantially accurate and result can be used for the preliminary design of the enclosure. Accuracy of deign can be developed further by considering the effect of noise leak through opening and the effect of sound attenuator.



## **DEDICATION**

To my family who proved lovely relationships beyond the logic

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## TABLE OF CONTENT

Declaration of the candidate & supervisor	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of content	v
List of figure	vii
List of Tables	ix
List of abbreviations	x
List of Appendices	xi
1. Introduction	1
2. Development of SPL model for packaged standard type PG enclosure	10
2.1 IL model for closed fitting sealed enclosure	11
2.2 Development of SPL model of PG with acoustic enclosure	15
2.3 Effect of modal variables on SPL model	16
2.3.1 Effect of panel dimension on enclosure IL model	17
2.3.2 Effect of source to panel distance on enclosure IL model	19
2.3.3 Effect of sheet metal material property on IL model	20
2.3.4 Effect of sheet metal material thicken on IL model	22
2.3.5 Effect of sound absorption material type on IL model	23
2.3.6 Effect of sound absorption material thickness on IL model	25
2.4 Customer required constrains on SPL model	26
2.4.1 Cost constrain	27
2.4.2 Weight constrain	29
3. Design methodology	30
3.1 Genetic Algorithm tool for optimization	30
3.2 Development of GA optimization code using MATLAB	31
3.3 Design steps of acoustic close fitting enclosure for a PG	35
4. Results and discussion	37



4.1 Comparison of model predicted data with manufacturer given data for commercially available PGs	37
4.2 Construction of design variables based enclosure for predicted overall SPL validation	39
5. Conclusion and recommendation	41
5.1 Future works and consideration	42
Reference list	44
Appendix A: Manufacturer data of commercially available PGs	46
Appendix B: Enclosure material properties	48
Appendix C: MATLAB codes developed for the design methodology	50
Appendix D: GA optimization parameter selection	53
Appendix E: MATLAB .m files for GA optimization design calculator Development as GUI (CD Rom)	54
Appendix F: Noise measuring standards	55
Appendix G: Predicted design variable data for commercially available PGs	56



## LIST OF FIGURES

Figure 1.1	TL and IL loss behavior of a close fitting enclosure	4
Figure 1.2	SPL spectrum of “Cummins” Power Generators at 1m distance and 110% load	5
Figure 1.3	Source of noises for 30kW Diesel PG	6
Figure 1.4	Power Generator with soundproof enclosure	7
Figure 2.1	Schematic diagram of sealed close fitting enclosure with PG noise source and noise measurement point	11
Figure 2.2	Simplified one dimensional model for closefitting enclosure panel	12
Figure 2.3	Effect on IL due to change in PG dimension	18
Figure 2.4	Effect on IL due to change in PG dimension at low frequency	18
Figure 2.5	Effect on IL due to change in source to panel distance	19
Figure 2.6	Effect on IL due to change in source to panel distance at low frequency	20
Figure 2.7	Effect on IL due to change in sheet metal material property	21
Figure 2.8	Effect on IL due to change in sheet metal material property at low frequency	21
Figure 2.9	Effect on IL due to change in sheet metal material thickness	22
Figure 2.10	Effect on IL due to change in sheet metal material thickness at low frequency	23
Figure 2.11	Effect on IL due to change in sound absorption material type	24
Figure 2.12	Effect on IL due to change in sound absorption material type at low frequency	24
Figure 2.13	Effect on IL due to change in sound absorption material thickness	25
Figure 2.14	Effect on IL due to change in sound absorption material thickness at low frequency	26
Figure 2.15	Price equation of galvanized steel material	28
Figure 2.16	Price equation of sound absorption material with 0.05m, 0.075m and 0.1m thickness	28
Figure 3.1	GUI Interface of GA tool box	32



Figure 3.1	Optimization GUI developed using MATLAB	34
Figure 3.2	Flow char of enclosure design methodology	35
Figure 4.1	SPL spectra of unenclosed PG and predicted and measured SPL of enclosed PG	40
Figure B.1	Flow resistivity for rock wool and glass wool	49
Figure F.1	Microphone positions for rectangular shape measuring shape according to ISO3744	55
Figure F.2:	GUI of virtual sound level meter VSLM 0.4	55

## LIST OF TABLES

Table 4.1: Overall SPL, cost & weight of commercially available PG	38
Table 4.2: Predicted overall SPL, cost & weight of minimum overall SPL modal	38
Table 4.3: Predicted overall SPL, cost & weight of source panel distance constrained modal	38
Table 4.4: Predicted overall SPL, cost & weight of overall SPL constrained model	38
Table A.1: SPL spectra of "Cummins" unenclosed PGs	46
Table A.2: Dimensions of "Cummins" open and packaged standard type enclosed PG	46
Table A.3: Overall SPL of "Cummins" packaged standard type enclosed PG	47
Table B.1: Material properties of sheet metal material	48
Table B.2: Material properties of material use for passive noise barriers	48
Table D.1: Optimal SPL results with respect to various GA parameters	53
Table G.1: Predicted design data for minimum SPL	56
Table G.2: Selected design values for fabrication for minimum SPL	56
Table G.3: Predicted design data for source to panel distance constrained model	56
Table G.4 :Selected design values data for source to panel distance constrained model	57
Table G.5: Predicted design data for overall SPL constrained model	57
Table G.6: Selected design data for overall SPL constrained model	57

## LIST OF ABBREVIATIONS

Abbreviation	Description
SIL	Sound Insertion Loss
dB	Decibel
OSHA	Occupational Safety and Health Administration
dB(A)	A weighted Decibel
ANC	Active Noise Control
PNC	Passive Noise Control
TL	Transmission Loss
IL	Insertion Loss
GA	Genetic Algorithm
GUI	Graphical User Interface



## LIST OF APPENDIXES

Appendix A: Manufacturer data of commercially available PGs	46
Appendix B: Enclosure material properties	48
Appendix C: MATLAB codes developed for the design methodology	50
Appendix D: GA optimization parameter selection	53
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