



IPRO 344: IMPROVING ENERGY-EFFICIENCY AND OFFERING QUALITY AUDIO IN MOBILE DEVICES

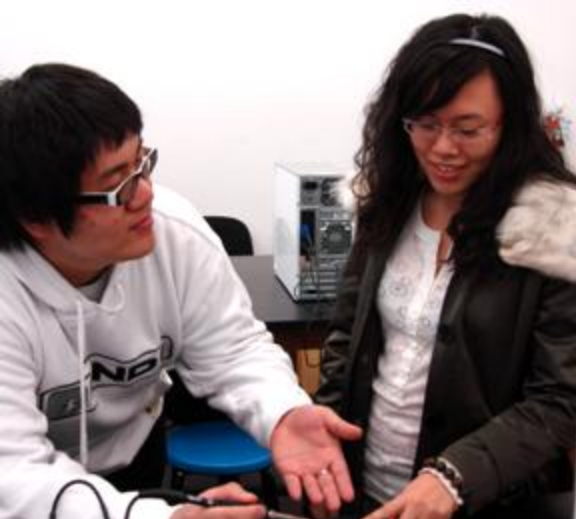
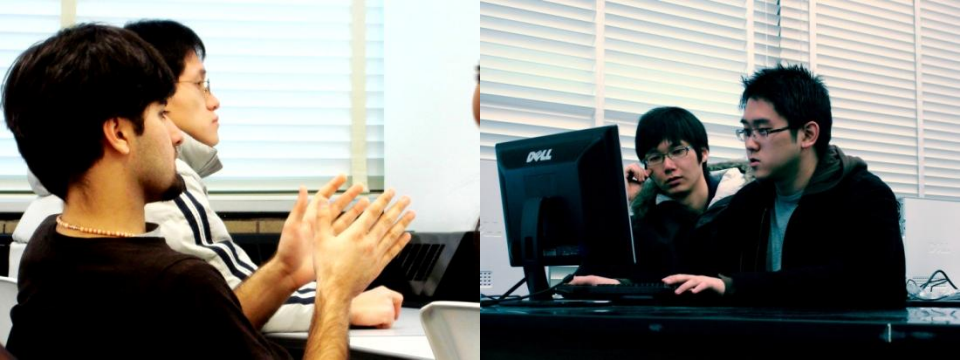
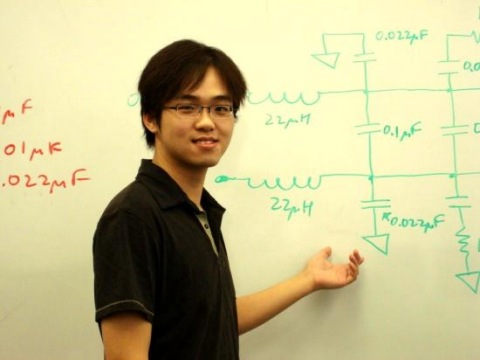


Objectives

- Study commercially available audio amplifiers
 - Efficiency
 - Audio Quality
- Things to focus on to improve efficiency in amplifiers
 - Voltage Regulation
 - Pre-amplifier Design
- McDonald's Drive Thru Audio System
 - Research (Field Trips, Schematics)
 - Feedback (Microphones, Class D Speaker Design)

A blurred photograph of a meeting room. Several people are seated around a table, looking towards a large screen displaying a presentation. The room has large windows on the left side. The overall scene is out of focus, emphasizing the context of a business meeting.

Team Introduction



SUBTEAMS

Research Team

G. Choi, M. Mikulka, C. Song,
G. Wakhlu

Webpage Team

D. Spears, J. Godfrey, Y. Park,
C. Sun

Documentation Team

N. Kwak, Y. Zhang, N. Terry, D.
Spears

Purchasing Team

N. Terry, M. Mikulka

Implementation Team

J. Godfrey, H. Cho, G Wakhlu,
G. Choi, N. Kwak, C. Song, M.
Mikulka

Tools and Media Team

Y. Zhang, D. Spears, C. Sun

Poster Team

Y. Zhang, G. Wakhlu, Y. Park,
H. Cho

Logistics & Attributes Team

G. Wakhlu, N. Terry

Presentation

C. Song, G. Wakhlu, N. Terry



Technical Outline

I PRO 344



What is pre-requisite for an outstanding audio system?



IPRO 344



The most important component from the efficiency and signal to noise standpoint is:

The Amplifier!



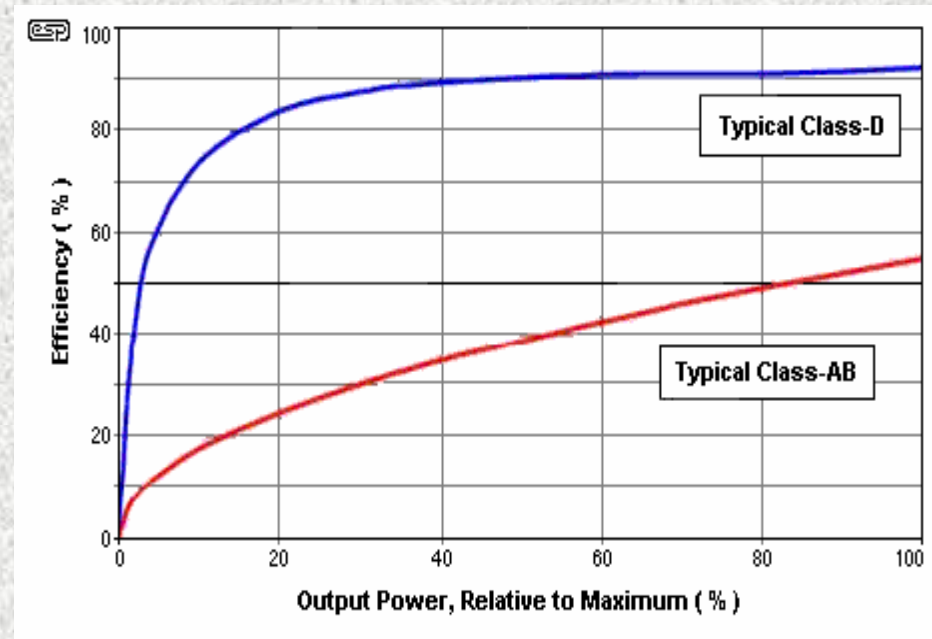
CLASS D Amplifiers and their Benefits

- Amplifiers are classified into letter grades based on what parts of the original waveform are amplified. A/B amplifiers are very common

- Class Ds a better option

- Since the traditional amplifiers have output devices that conduct even when “off.”

- This dissipates power, which means there is zero percent efficiency during this time.



- This lowers the maximum efficiency of these amplifiers.

I PRO 344



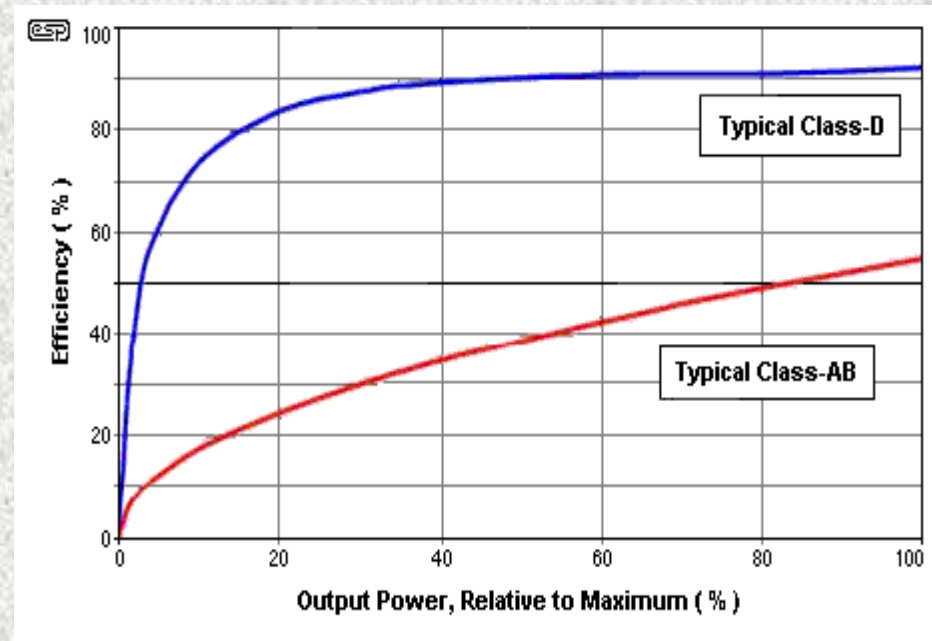
- Class D amplifiers operate in switching fashion.

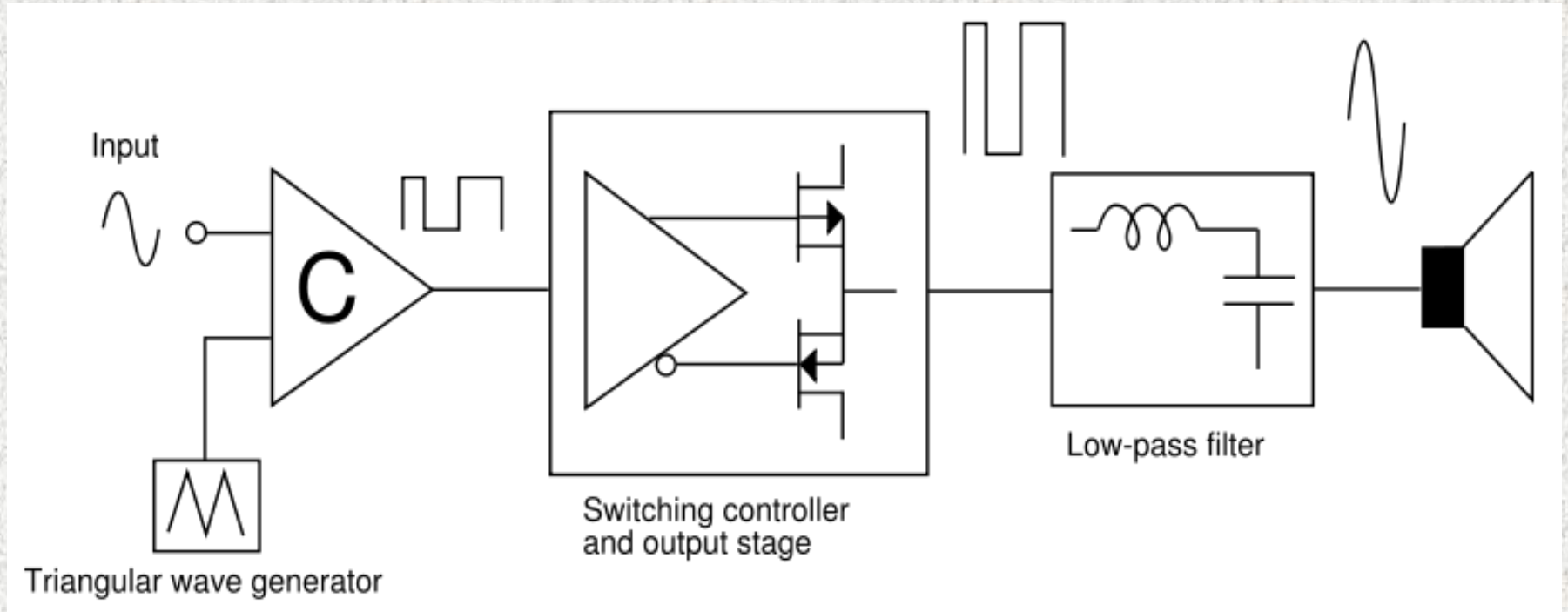
They represent the maximum theoretical efficiency of any audio amplifier, with a minimum of audio distortion.

- Less power from the power supply, and this requires smaller heat sink.

- High power levels and small design.

- Power dissipation is theoretically zero. In the “off” state, current through the device is zero.





- Reduction in size and weight of the amplifier,
- Reduced power waste as heat dissipation
- Reduction in cost due to smaller heat sink and compact circuitry,
- Very high power conversion efficiency, usually $\geq 90\%$.

The Importance of Microphones –Noise Reduction

- After carefully consideration, we prefer Shure WL185 Microphone
- Good for general purpose sound reinforcement applications requiring good rejection of ambient noise.
- Use of windscreen highly recommended.
- Pickup angle is 130 degrees.



I PRO 344



Progress

- Selection of equipments:
 - Shure WL185 Microphone
 - Breadboards
 - Post-Amplification Filter
 - Harmonic Distortion Unit
- Design:
 - Pre-Amplifier Design
 - Filter Design
- I PRO Deliverables
 - Project Plan
 - Code of Ethics Report
 - Midterm Report
 - Midterm Presentation
- Research
 - McDonald's Audio Device Specifications and Schematics
 - Analysis of other non-technical aspects of a Drive Thru



I PRO 344

Challenges

• Procurement Delays

- ~ 10 items being shipped

• Design Issues

- Greater Power Losses
- Breadboard designs causing noise
- Speech Tests



• General:

- McDonald budget
- McDonald's timeline
- Will Drive Thru Performance Increase Significantly?
- I PRO Timelines

**IMPROVING ENERGY-
EFFICIENCY AND OFFERING
QUALITY AUDIO IN MOBILE
DEVICES**

THANKYOU

IPro344

Illinois Institute of Technology, Chicago, IL, USA

All Rights Reserved © 2008