

BUY QUIET 2016

**Are quiet products
an advantage for manufacturers?**

Industry Experience in the United States

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Outline – American Experience

- Introduction
- Two Technology for a Quieter America (TQA) NAE sponsored workshops
- Why do manufacturers design quieter products ?
 - Laws and regulations
 - Lawsuits
 - Corporate Buy Quiet programs
 - **Market demand**
 - Opportunity
- Specific product types
- Government Buy Quiet Programs
- Sources of product noise information
- Summary

2015 TQA NAE Workshop

- “Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction”
- A TQA Workshop and I-INCE Symposium sponsored by
 - INCE Foundation and Noise Control Foundation and
- Hosted by US National Academy of Engineering
- Washington, D.C., October 6-7, 2015
- 30 presentations on progress in noise control
- Some of the material for this presentation is from the 2015 TQA report
- Report is available at no cost at INCE/USA web page
 - inceusa.org/Reports/TQA_EngrQuieterAmerica_2016.pdf

2014 TQA NAE Workshop

- “Reducing Employee Noise Exposure in Manufacturing, Best Practices, Innovative Techniques, and the Workplace of the Future ”
- A workshop sponsored by
 - INCE Foundation, Noise Control Foundation, and the National Institute of Occupational Safety and
- Hosted by US National Academy of Engineering
- Washington, D.C., February 19 – 20, 2014
- 27 presentations
- Some of the material for this presentation is from the 2014 TQA report
- Report is available at no cost at INCE/USA web page
 - *http://inceusa.org/Reports/TQA_EmployeeExposureMfg_2016.pdf*

Why do Manufacturers design quiet products?

(based on Olvera et.al. NC 16)

- Laws and regulations
 - Noise ordinance (on community noise, construction noise)
 - Construction:
 - FHWA limits
 - Local noise ordinances – NYC, Boston “Big dig”
 - Safety regulations (hearing protection)
 - Product emission regulations
 - Foreign market regulations
- Lawsuits
 - Community annoyance
 - Work-related hearing loss
 - Product-related hearing loss
- Corporate Buy-Quiet programs
- Market demand
 - Open kitchens and homes
 - Washing machines in living area of homes and not in basements
- Opportunity

Progression of Noise Control vs Product Type

- ▶ Complaints of noise have led the way to much of quiet technology we now see
- ▶ Some companies have seen opportunity to market quiet products
- ▶ Table summarizes progress made in noise control
- ▶ From Overa, et.al., "What Causes Quiet Products to Come To Market?", NOISE-CON 2016

Noise Control Cause \ Noise Control Fields	Aircraft	Highways	Construction	Compressor	Valves	Pneumatic Tools	Automobiles	Dishwashers
Complaints	X	X	X					X
Lawsuits	X	X	X			X		
Regulations, USA	X	X						
Regulations, other			X	X	X	X		
Buy-quiet					X	X		
Advertising					X		X	X
Opportunity				X	X	X	X	X

Why do Manufacturers design quiet consumer products?

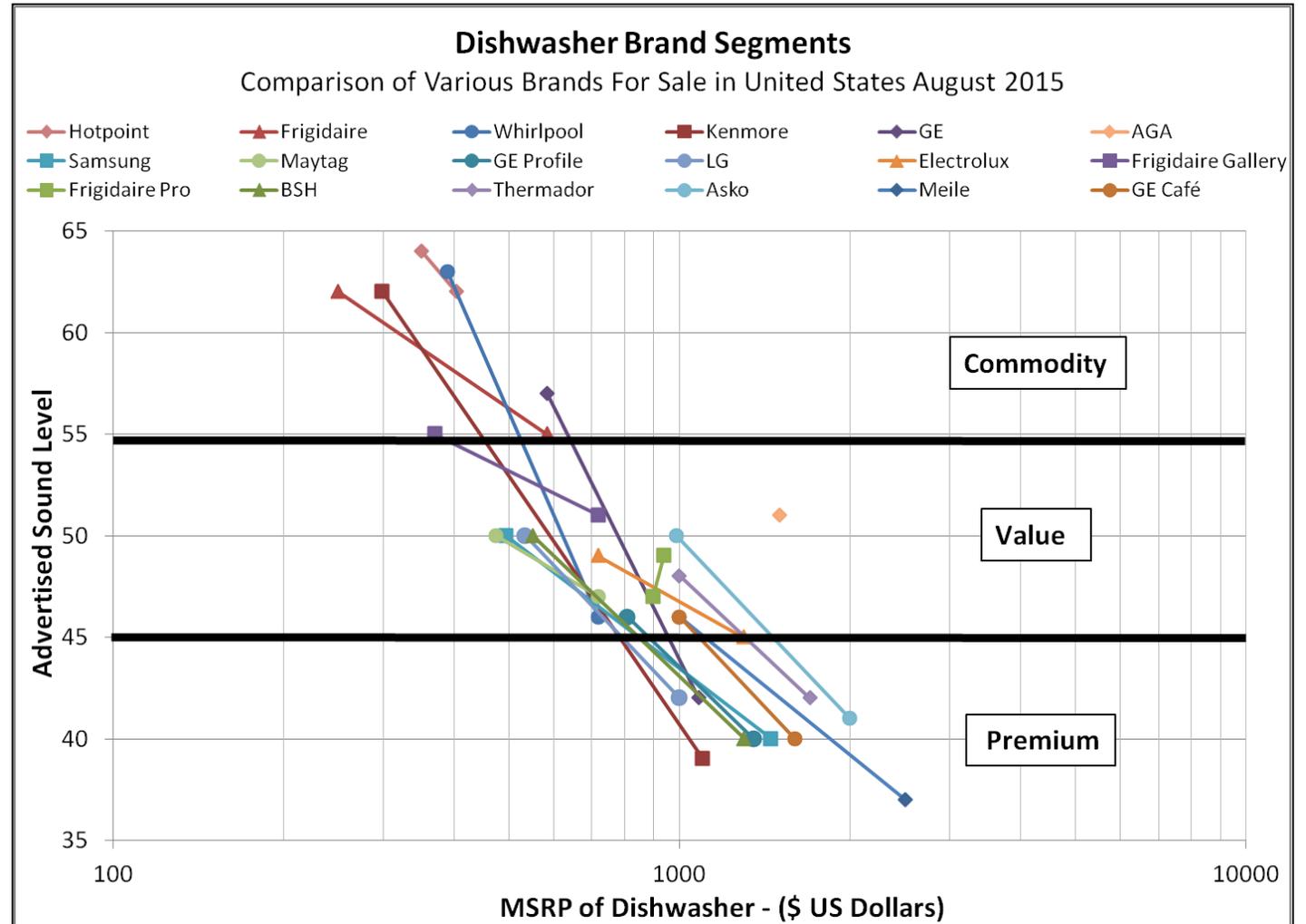
- 84% of consumers said that “ultra quiet operation” of dishwashers is important in a 1999 survey. (KDBN in NAE TQA report, 2010, p8)
- Evolution in the way people live is important. Sound quality is an important issue. (Morris in TQA 2015 report, p 5)
- Noise is one of the most important properties the Consumer Reports evaluates and consumers willing to pay more for quiet products
 - (Connelly in TQA 2015 report, p 5)
- People are willing to pay 50% more for a quiet blender (Bowen, TQ 2015 report, p16)
- Open design of newer homes – home appliances need to be quieter

Dishwashers

- Information from Kevin Herreman NOISE-CON 2016 paper
- In 2004 Sears[®] introduced a single number dishwasher sound rating for units to be sold in their stores
- Metric: Average Sound Power Level determined according to IEC 60704 (from 3 units measured)

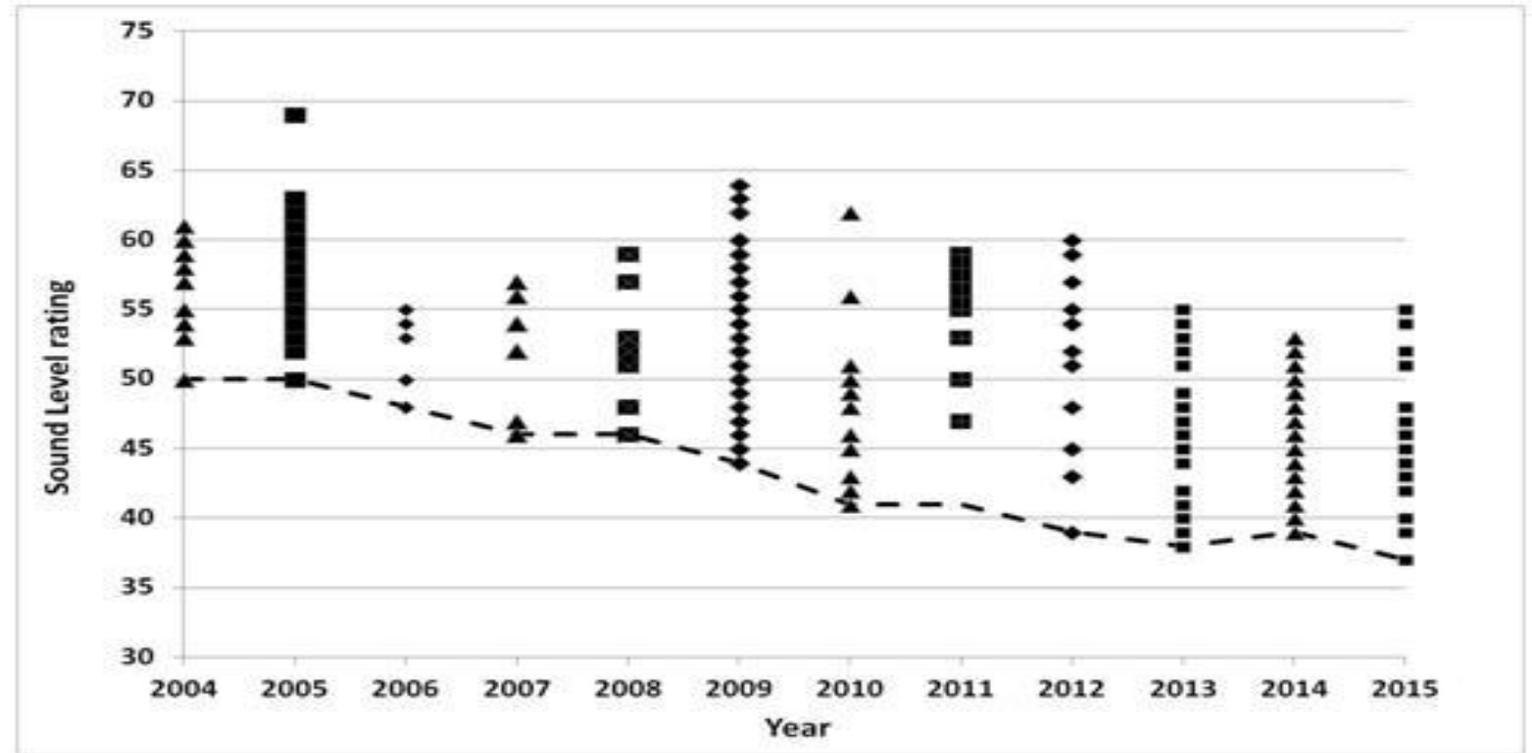
Dishwasher Sound Power Level vs Price

- **Premium units are quiet**
 - Manufacturers link lower sound level to higher quality
 - Brand identified by the range of sound level ratings.
 - Provides greater profit and more brand recognition
- From Herreman NOISE-CON 2016
- MSRP = Manufacturer's Suggested Retail Price



Dishwasher Sound Power Level vs Year

- Range of new models is quieter
- Quietest units get quieter
- Noisiest units are quieter
- Dishwasher in 2015 vs 2005
 - Quietest is ~13 dB lower (37 dB)
 - Loudest is ~15 dB lower (55 dB)



From Herreman NOISE-CON 2016

Dishwashers - Value of Noise Reduction

- Using a regression model for the 2015 data, Herreman found that with a reduction of 11 dB in sound power level rating, the MSRP increases \$104 per dB.
- Actual data for 2015 shows this increase is \$129 per dB.

Sound Level Rating	2015 Average Retail Price	2015 Model Predicted Retail Price
49	\$902.00	\$ 792.48
38	\$2324.00	\$ 1,938.29
Price Difference	\$ 1,421.67	\$ 1,145.81

Dishwasher – Herreman Conclusions

- Providing consumers with a consistent sound rating created and sustains the demand for lower sound level rated dishwashers
- Consumers continue to find value in lower sound level rated dishwasher models paying >\$2000 for some units
- Competition to gain a market advantage by selling dishwashers with lower sound level ratings continues through brand segmentation
- The market is creating a migration of lower sound levels to lower cost dishwashers

From Herreman NOISE-CON 2016

Household Food Waste Disposers (FWD)

- Used to dispose of food waste by grinding it into small particles that can be flushed into the sewer line
- Development of quieter models spurred by increased emphasis on quiet kitchen appliances
 - Appliance noise more noticeable in open concept or integrated family rooms/kitchens
 - Other appliances (refrigerators, dishwashers) became quieter



From Cynthia Jara-Almonte, "Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction", 2016, p 23 - 25

Household Food Waste Disposers - Marketing

- **Challenge for marketing group was how to sell “quiet”**
 - Evolution (quiet) line set new price points for food waste disposers
 - Needed to be able to explain the gains for the higher prices
 - To end-users at point of sale
 - To plumbers
 - To retail customers such as Lowes and Home Depot
- **Quantifying sound performance was a challenge**
 - Without an industry standard, could not provide a “level” value on packaging or in literature
 - Internally used Zwicker loudness as metric
 - Developed a comparative measure between Badger 5 and Evolution units
 - Expressed as percent quieter while grinding standard load (carrots, celery, lettuce, and cooked steer rib bones)
 - Excel– 60% quieter than a Badger 5
- **Developed videos, animations, advertising and training materials to explain improvements in sound and grind**
 - Comparative sound modules used in store displays
 - Engineers helped staff industry trade show booth during product launch
 - Kits developed for sales force to help them explain the new technology

From Cynthia Jara-Almonte, “Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction”, 2016, p 23 - 25

IT Products (from Beltman 2015)

IT products much quieter, with higher performance

Acoustic noise trend from 1993 to 2015

- Large variations exist due to models, manufacturers etc
- Desktop Products quieter by more than 10 dB
- Notebook computers quieter by ~ 5 dB (idle)
- Noise levels comparable to environment background

Leaf Blowers

- Primary issue is sound level and sound quality (high frequency whine)
- Issue for quieter units is that they are perceived to be less powerful
- Reasons for quieter: to prevent regulations banning leaf blowers
- ECHO has designed quiet leaf blowers from ground up – manufacturer's cost has been passed on to purchasers with no profit.

See Will, Larry, "Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction", 2016, p 26 - 33

ECHO Has Five Low Noise Blowers

ECHO has 13 leaf blowers in the line, and 5 of them are low noise.



PB-250LN



PB-255LN



PB-265LN



PB-760LNH



PB-760LNT

Power Generator Sets

- Noise Design goals based on:
 - Regulations or laws
 - EU Directives
 - Customer request or demands

From More, Shashikant, “Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction”, 2016, p 79 - 84

Global Noise Limits Map for Cummins’ Power Gensets

Regions	Customer Required Noise Level	Property-Line Noise Levels	CE Noise Limits	CPCB-II Noise Limits
North-America	Yes	Yes	No	No
South-America	Yes	No	Yes ^{***}	No
Europe	Yes	No	Yes – All 50 Hz products	No
Asia – India	Yes	No	Yes/No?	Yes
Asia – China	Yes	No	Yes/No?	Yes/No?
Australia	Yes	No	Yes	No
Middle East	Yes	No	Yes ^{***}	No

- *****Customers demanding CE Limits even for 60 Hz gensets with an understanding that CE Mark represents higher product quality level**
- **CE Regulations based noise limits relevant (applicable or considered or adopted) for most part of the world**

US Government Buy Quiet Programs - NASA

- National Aeronautics and Space Administration (NASA) developed a Buy Quiet program.
- NASA field centers and facilities are required to maintain buy-quiet programs.
- NASA developed a web site to implement such programs:
<http://buyquietroadmap.com/>

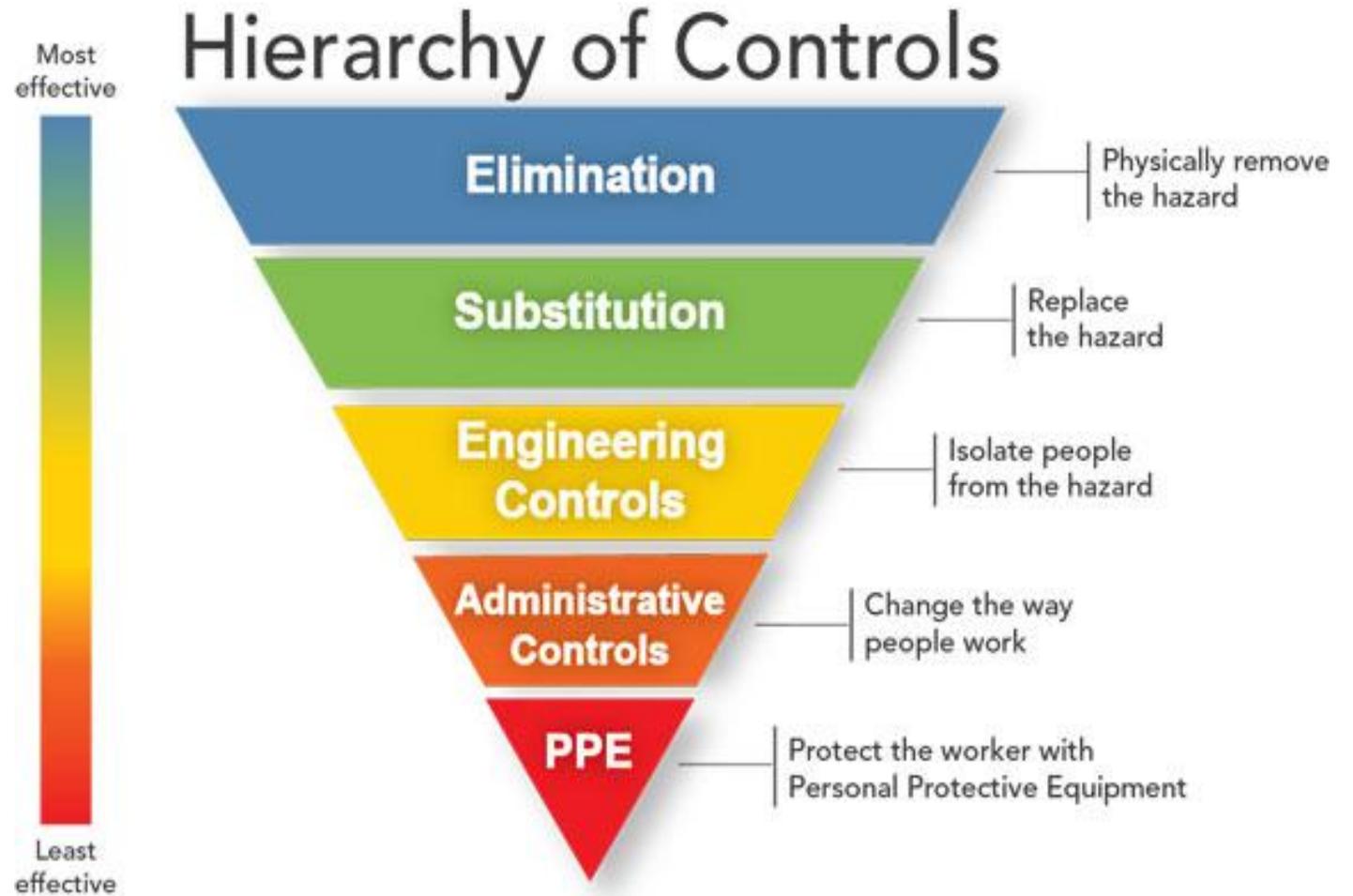
US Government Programs - NIOSH

- NIOSH Buy Quiet Program
 - <http://www.cdc.gov/niosh/topics/buyquiet/>
 - <http://www.cdc.gov/niosh/topics/buyquiet/efforts.html>
- NIOSH Prevention through design program:
 - <http://www.cdc.gov/niosh/topics/ptd/>
- NIOSH Safe and Sound Award:
 - <http://www.safeinsound.us/>

US Government Buy Quiet Programs - NIOSH

- “Buy Quiet is the most effective means to lower noise levels in the workplace and reduce the risk of occupational noise induced hearing loss.” – email from William Murphy, NIOSH, 2016

Figure from:
<http://www.cdc.gov/niosh/topics/hierarchy/>



NIOSH Safe and Sound Award

The NIOSH Safe in Sound award promotes steps to make quieter workplaces.

- 2012 Awardees:
- 3M Hutchinson, Minnesota facility
 - Initiated a Buy-Quiet Program shooting for 75 dBA per machine
- Colgate Palmolive - noise program:
 - Designing quiet
 - Reducing noise at the source
 - Building capabilities
 - Operating quietly

Sources of information on product noise

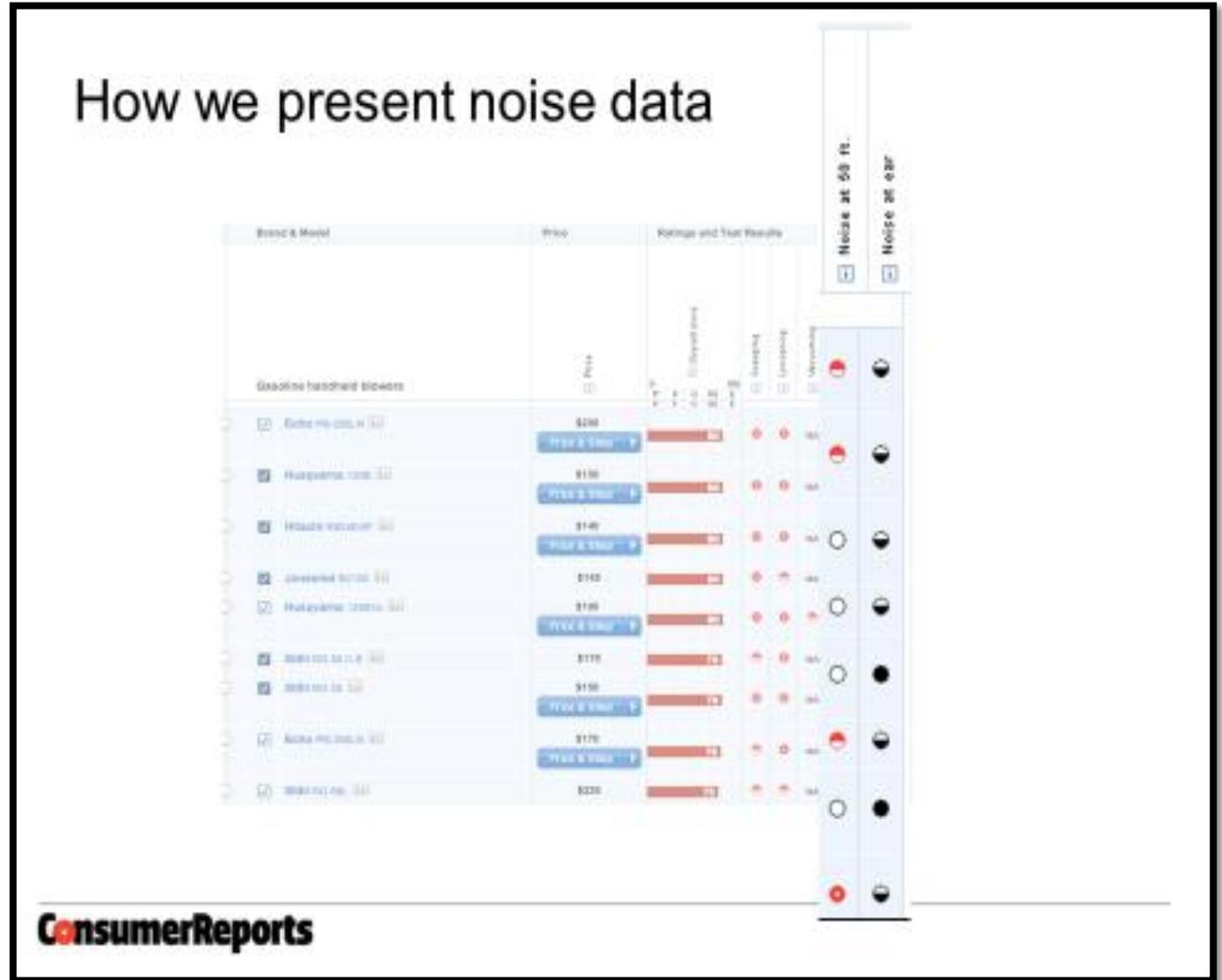
- *Consumer Reports* rankings
- Retail Stores – in store and on web pages
- Customer product reviews on retail store web pages
- NIOSH Power Tools database

Consumer Reports rankings

- Consumer Reports (CR) is a nonprofit organization that evaluates product noise, among many other factors, to inform consumers' purchasing decisions.
- Consumer Reports publishes product reviews in its monthly magazine *Consumer Reports* and on-line at its web page.
- **Noise is one of the most important properties CR evaluates.**

Consumer Reports rankings

- From Mark Connelly, "Engineering a Quieter America: Progress on Consumer and Industrial Product Noise Reduction", 2016, p 9- 12



Retail Stores – web pages

- From Overa, et.al., "What Causes Quiet Products to Come To Market?", NOISE-CON 2016

The screenshot displays a product page for 'Built-In Dishwashers' on a retail website. The page includes a navigation bar with logos for Best Buy, Home Depot, Lowe's, and Sears. The main content area features a list of filters on the left and a 'Refine Results' section on the right. Several filter sections are highlighted with red boxes:

- Operating Sound Level**: A dropdown menu with options:
 - Quietest: Less than 50dBA (124)
 - Quieter: 50 - 55dBA (87)
 - Quiet: 56 - 60dBA (12)
 - Average: 61dBA or More (23)
- Sound Rating Range (Decibels)**: A dropdown menu with options:
 - Average 61 DBA And Up (31)
 - Quiet 56-60 DBA (21)
 - Quieter 51-55 DBA (78)
 - Quietest 0-50 DBA (106)
- Dishwasher Sound Rating (Decibels)**: A list of radio button options:
 - 0 - 44.99 (55)
 - 45 - 49.99 (82)
 - 50 - 54.99 (56)
 - 55 - 59.99 (33)
 - 60+ (36)
- Common Dishwasher Size**: A section with a plus sign and a dropdown menu.
- Actual Dishwasher Height (Inches)**: A section with a plus sign and a dropdown menu.
- Tub Material**: A section with a plus sign and a dropdown menu.

The 'Refine Results' section on the right includes filters for Brand, Appliance Color/Finish, Cycles, and Price. The 'Refine Your Search' section on the far right includes filters for Brand, Color Family, Price, Control Location, Width, Height, and Decibel Range.

NIOSH Power Tools database

- The NIOSH Power Tools Database makes noise data available to:
 - tool buyers,
 - users, and
 - manufacturers of powered hand tools.
- <http://wwwn.cdc.gov/niosh-sound-vibration/>

Summary: US Manufacturers Experience

- Two TQA Workshops and reports with experiences
- Why do Manufacturers design quiet products?
 - Laws and regulations
 - Lawsuits
 - Corporate Buy Quiet programs
 - Market demand
 - Opportunity
- Many examples and pointers given.

Summary: US Manufacturers Experience

- “Buy Quiet is the most effective means to lower noise levels in the workplace and reduce the risk of occupational noise induced hearing loss.”
 - William Murphy, NIOSH, 2016
- Designing and manufacturing quiet products is the most effective means to solve noise problems – for both workplace and community noise.
- Manufacturers should take out the elements that degrade sound quality (such as tones).
- There are numerous incentives for US manufacturers to design quiet products.

Thank you

Any questions and discussion?