



Comparison of products

P. Kurtz, BAuA

R. Hellweg, Hellweg Acoustics

Purpose of comparing noise emission data I

The comparison and assessment of noise-emission data is relevant for

Machine manufacturers

- ***Machinery design engineers*** to check whether the applied noise reduction measures for the specific machine are sufficient to comply with the competition on the market or the state of the art of noise control
- ***Management*** to decide about a sufficient competitiveness of the machine
- ***Marketing department*** to decide about optimal marketing strategies
- ***Legal department*** to check compliance with legal requirements

Purpose of comparing noise emission data II

Purchasers of machinery

- To compare similar machinery or equipment available on the market with regard to noise emission
- To carry through a noise exposure risk assessment

Authorities

- To check compliance with legal requirements (limit values, minimisation obligation)
- To set new limit or action values

Acoustics consultants

- To perform a noise immission/exposure forecast
- To check alternatives

Standardisation working groups

- Preparing noise test codes for a specific machine family

Indispensable prerequisites to allow comparison of noise emission data of machines for purchasers

- **Characteristic quantities unambiguously describing the property of a machine to generate airborne noise such as**
 - **the emission sound pressure level at workstation**
 - **the sound power level**
- **Basic measurement methods for determining the characteristic quantities**
- **Machinery specific noise test codes unambiguously stating which basic measurement method with the same grade of accuracy shall be applied and clearly defining the mounting and operating conditions during measurement**
- **Definition of how a noise emission declaration should look like**
- **Legal requirement to make a noise emission declaration mandatory**

Basic noise emission standards, a prerequisite for noise emission comparison

- **Basic noise emission measurement standards are required for the determination of the**
 - **A-weighted sound power level measurement standards such as**
 - **ISO 3740 series of standards based on sound pressure measurements**
 - **ISO 9614 - 1-3 standards based on sound intensity measurements**
 - **A weighted emission sound pressure level measurement standards**
 - **ISO 11200 series of standards**



Reliable measurement results of defined accuracy allowing comparison if operating and mounting conditions are fixed in noise test codes

- **Standard on noise emission declaration and verification**
 - **ISO 4871**



Equal look of noise emission declarations, allowing a simple comparison and verification

The Noise Test Code, a prerequisite for noise emission comparison

- The purpose of a noise test code is to obtain comparable test results on the noise emissions of machines from the same family.
- A noise test code enables users to make comparisons and to check the declared noise emission data.
- Noise test code are machinery specific and define the basic measurement standards to be used and (very important!)
the **operating and mounting conditions** to be used for measurement

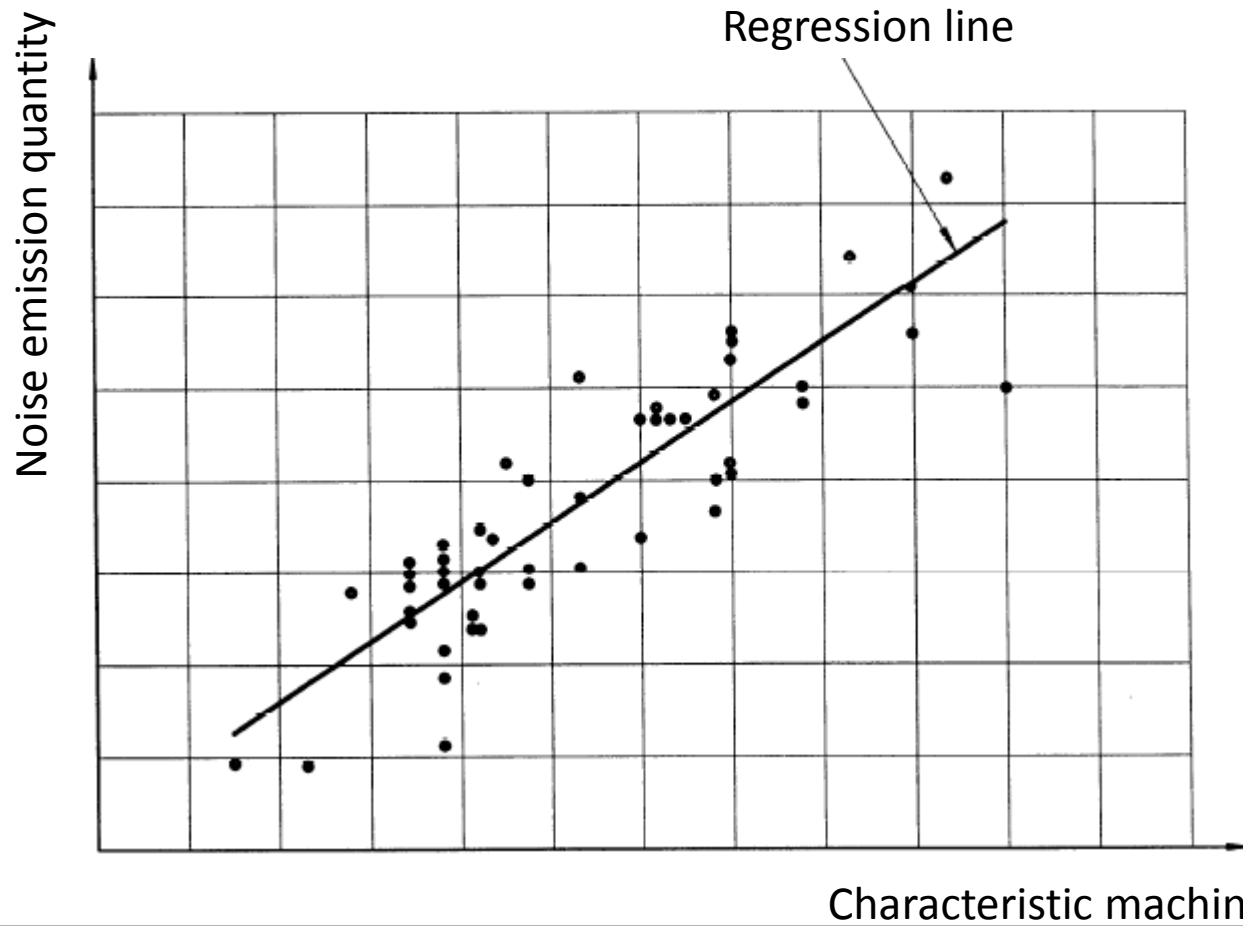


Requirements on the **operating and mounting conditions** during measurement according to ISO 12001:

- The noise test code shall specify precisely the installation and mounting conditions of the machine under test. They shall be representative of typical or normal use of the machine.
- The noise test code shall specify an operating condition that is reproducible and is representative of the noisiest operation in typical usage of the machine under test.

Presentation of noise emission values of specific machinery

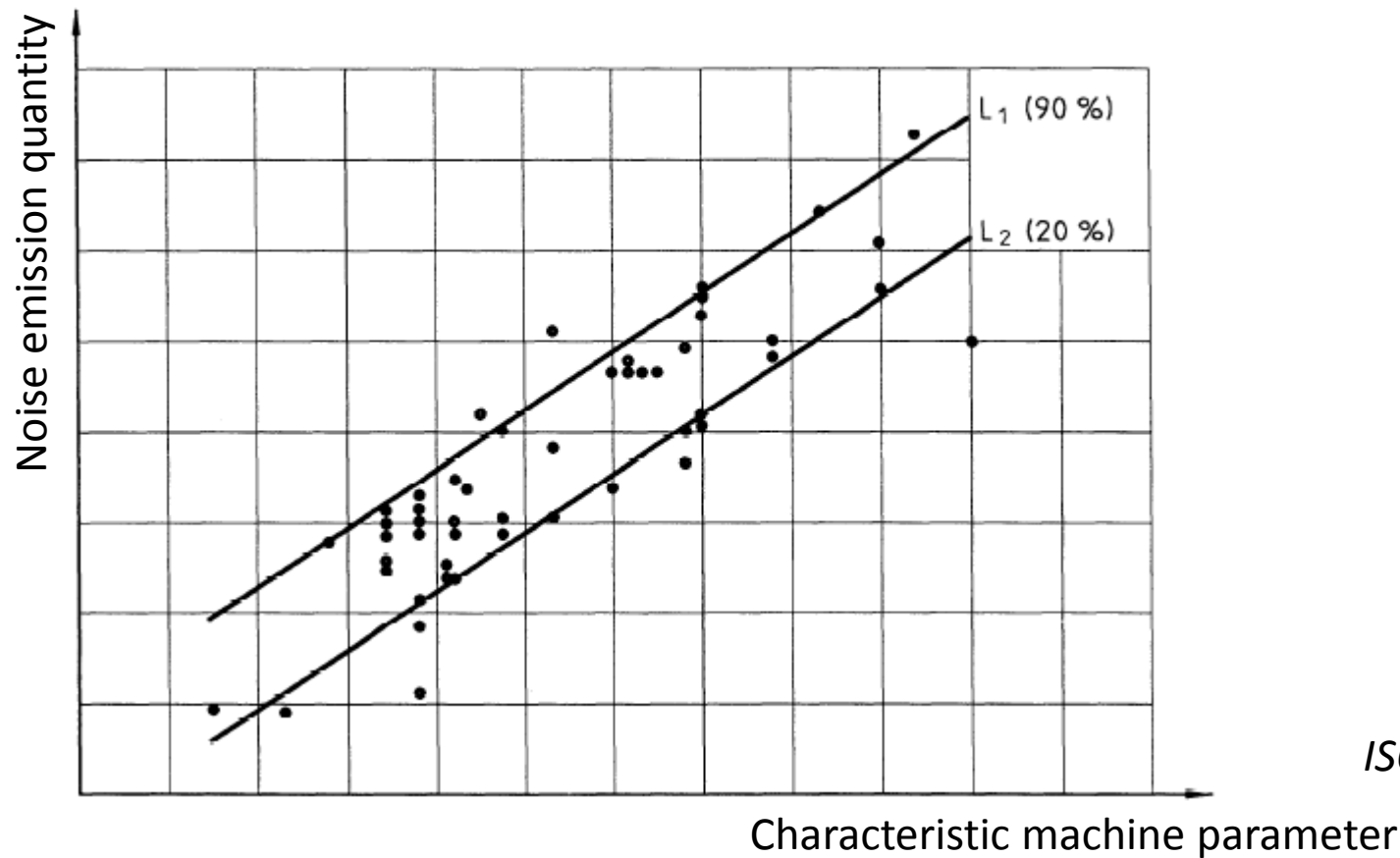
Presentation of noise-emission values (e.g. sound power levels) as a function of a noise emission relevant characteristic machine parameter (e.g. mechanical power output, number of revolutions etc.)



ISO 11689

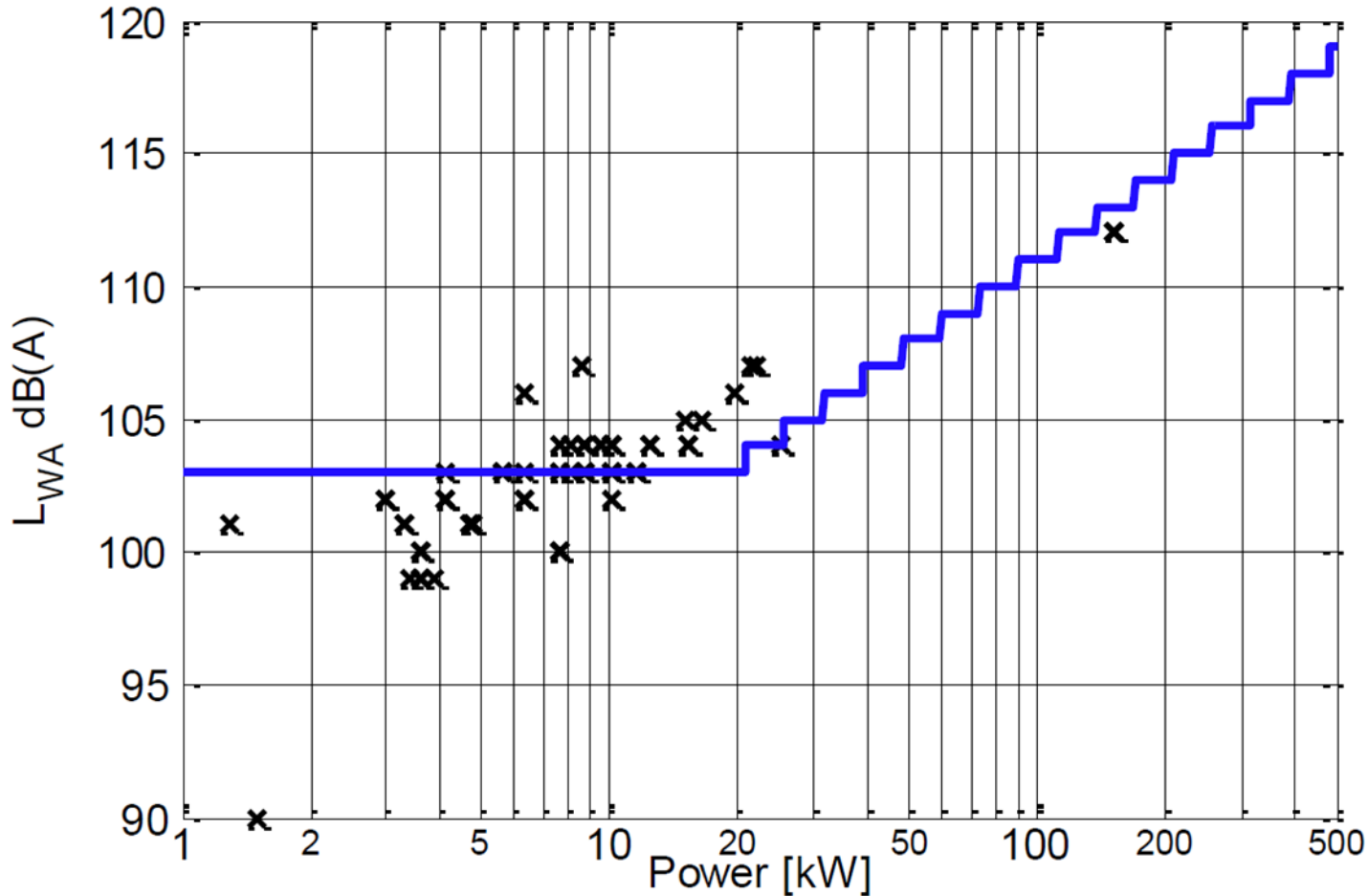
Presentation of noise emission values of specific machinery

Evaluation of noise-emission data and determination of noise-control performance e.g. to define the state of art of noise control for a specific machine family



ISO 11689

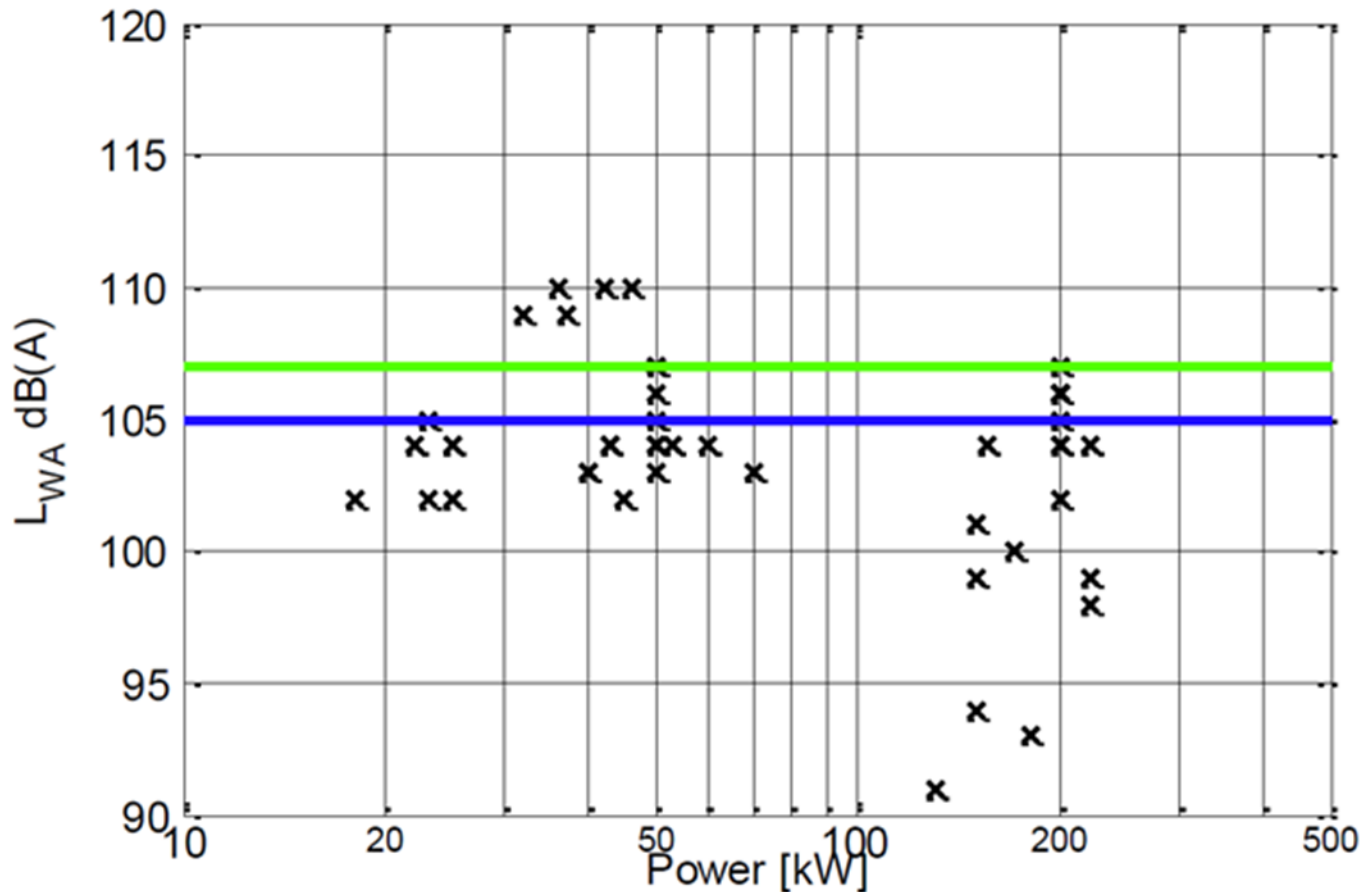
Survey of the noise emission of snow removing machines with rotating tools



Coloured graph shows possible limit line

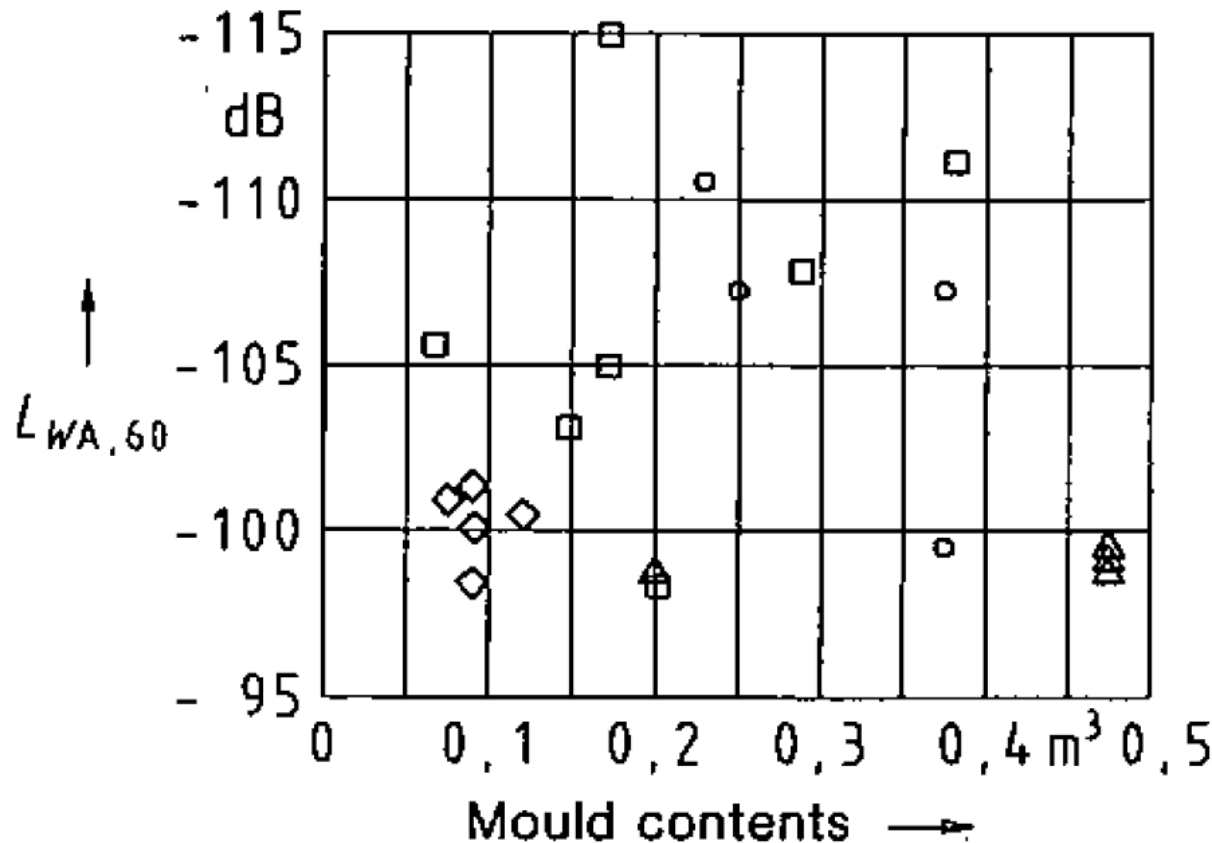
Odelia draft report, 2015

Survey of the noise emission of refuse collection vehicles



Odelia draft report, 2015

VDI ETS Guideline on the noise emission of moulding machines in foundries



- air impulse moulding machine
- shooting moulding machine
- △ airstream moulding machine
- ◇ suction moulding machine

VDI 3757, 1996

Noise emission data of machinery I

- More than 40 VDI ETS (Emission of technical sound sources) guidelines showing noise emission surveys for different machines e.g.
 - VDI 3757 Noise emission of foundry machines, 1996
 - VDI 3737-1-7 Noise emission of household appliances, 1981 – 1994
 - VDI 3731-1 Noise emission of compressors, 1982
 - VDI 3761 Noise emission of electric woodworking tools, 1990

VDI-RICHTLINIEN		Mai 1996	
VEREIN DEUTSCHER INGENIEURE	Emissionskennwerte Technischer Schallquellen Gießereimaschinen Characteristic noise emission values of technical sound sources Foundry machines	VDI 3757 Ausg. deutsch/engl. Issue German/English	
ICS 17.140.20; 25.120.30			
Deskriptoren: Emissionskennwert, Schallquelle, Akustik, Gießereimaschine			
Diese Übersetzung ist vom VEREIN DEUTSCHER INGENIEURE VDI, Düsseldorf/Deutschland, lizenziert, aber nicht geprüft worden. Verbindlich für den Inhalt der Richtlinie ist die deutsche Fassung.		This translation has been licensed by VEREIN DEUTSCHER INGENIEURE, VDI, Düsseldorf/Germany, but has not been examined. The original German version is the official version as regards content of the guideline.	
Inhalt		Contents	
	Seite		Page
Vorbemerkungen	2	Foreword	2
1 Geltungsbereich	2	1 Scope	2
2 Zweck	2	2 Purpose	2
3 Zitierte Normen	3	3 References to standards	3
4 Kenngrößen und Meßbedingungen	3	4 Quantities and measurement conditions	3
4.1 Kenngrößen	3	4.1 Characteristic quantities	3
4.1.1 Schalleistungspegel	3	4.1.1 Sound power level	3
4.1.2 Emissions-Schalldruckpegel	4	4.1.2 Emission sound pressure level	4
4.1.3 Impulshaltigkeit	4	4.1.3 Impulsiveness	4
4.1.4 Zeitlich gemittelter Schalldruckpegel	4	4.1.4 Time-averaged sound pressure level	4
4.1.5 Angegebener Geräuschemissionswert	4	4.1.5 Declared noise emission value	4
4.2 Sonstige Begriffe	4	4.2 Further definitions	4
4.3 Meßbedingungen	4	4.3 Measurement conditions	4
4.3.1 Kernformmaschinen	5	4.3.1 Coremaking machines	5
4.3.2 Formmaschinen	5	4.3.2 Moulding machines	5
4.3.3 Ausleer- und Förderröste	6	4.3.3 Knock-out grids and knock-out trays	6
4.3.4 Strahlanlagen	7	4.3.4 Blasting equipment	7

**Not continued since the late 90s, due to missing support from industry!
Fears of industry that this data could be used for fixing limit values!**

Noise emission data of machinery II

EU Noise emissions for outdoor equipment – Database in relation to Directive 2000/14/EC on noise emissions

https://ec.europa.eu/growth/tools-databases/noise-emissions-outdoor-equipment_en

The screenshot shows the website interface for the 'Noise emissions for outdoor equipment - Database'. The header includes the European Commission logo and the text 'GROWTH Internal Market, Industry, Entrepreneurship and SMEs'. A navigation menu contains 'Single Market and Standards', 'Industry', 'Entrepreneurship and SMEs', 'Access to finance for SMEs', and 'Sectors'. A search bar is present. The main content area is titled 'Noise emissions for outdoor equipment - Database' and contains the following text:

Welcome to the NOISE database - an online tool for managing the processing of declarations of conformity, [in relation to Directive 2000/14/EC on noise emissions](#). The database is intended for use by manufacturers, authorised representatives, EU authorities and notified bodies.

This information has been compiled by DG Enterprise and Industry in order to fulfil its obligation under this Article of the Directive. It is updated annually.

Users of the database will want to be aware that whilst every effort has been taken to ensure the accuracy of the data provided errors may exist.

Equipment subject to noise limits

- [Compaction machines \(vibrating rollers, vibratory plates, vibratory rammers\)](#)
< 03/01/2006
[8. compaction machines \(only vibrating and non-vibrating rollers, vibratory plates and vibratory rammers\)](#)
- [Compaction machines \(only non-vibrating rollers\)](#)
- [Compressors](#)

Quality of the data very questionable due to missing quality checks. Partly mixture of sound pressure and sound power levels

Noise emission data of machinery III

NIOSH CDC Power Tools Database

Power Tools Database



Grinder

		Type	Model	Tech Specs	Mfgr	Sound Power Level – Loaded Test	Sound Power Level – Unloaded Test	Wattage (Electric) or CFM (Pneumatic)	Vibrations on Accel. (Left)	Vibrations on Accel. (Right)
Details	Noise Reduction Rating Calculator	Grinder	AG401	4-inch angle grinder	Ryobi	95	93	528	2.50	7.40
Details	Noise Reduction Rating Calculator	Grinder	9557PB	4 1/2-inch angle grinder	Makita	96	95	900	6.30	5.00
Details	Noise Reduction Rating Calculator	Grinder	AG451	4 1/2-inch angle grinder	Ryobi	97	91	660	5.20	11.90
Details	Noise Reduction Rating Calculator	Grinder	G12SR2	4 1/2-inch angle grinder	Hitachi	97	94	580	6.70	14.40
Details	Noise Reduction Rating Calculator	Grinder	R1000	4 1/2-inch angle grinder	Ridgid	98	96	960	5.60	21.70
Details	Noise Reduction Rating Calculator	Grinder	1775E	5-inch tuckpoint grinder	Bosch	98	99	1020	10.60	8.30
Details	Noise Reduction Rating Calculator	Grinder	DW402	4 1/2-inch angle grinder	DeWalt	98	99	900	10.80	22.80
Details	Noise Reduction Rating Calculator	Grinder	7430	4 1/2-inch angle grinder	Porter Cable	98	103	720	10.40	22.00

- Limited to power tools as it is only prepared for demonstration
- NIOSH conducted tests on the decibel levels and functionality of each product in a certified lab, and used standard testing procedures
- Too few machines tested, so that comparison in classes of similar performance is not possible

Important aspects

The use of comparative noise emission data is a very effective tool for noise reduction

This requires:

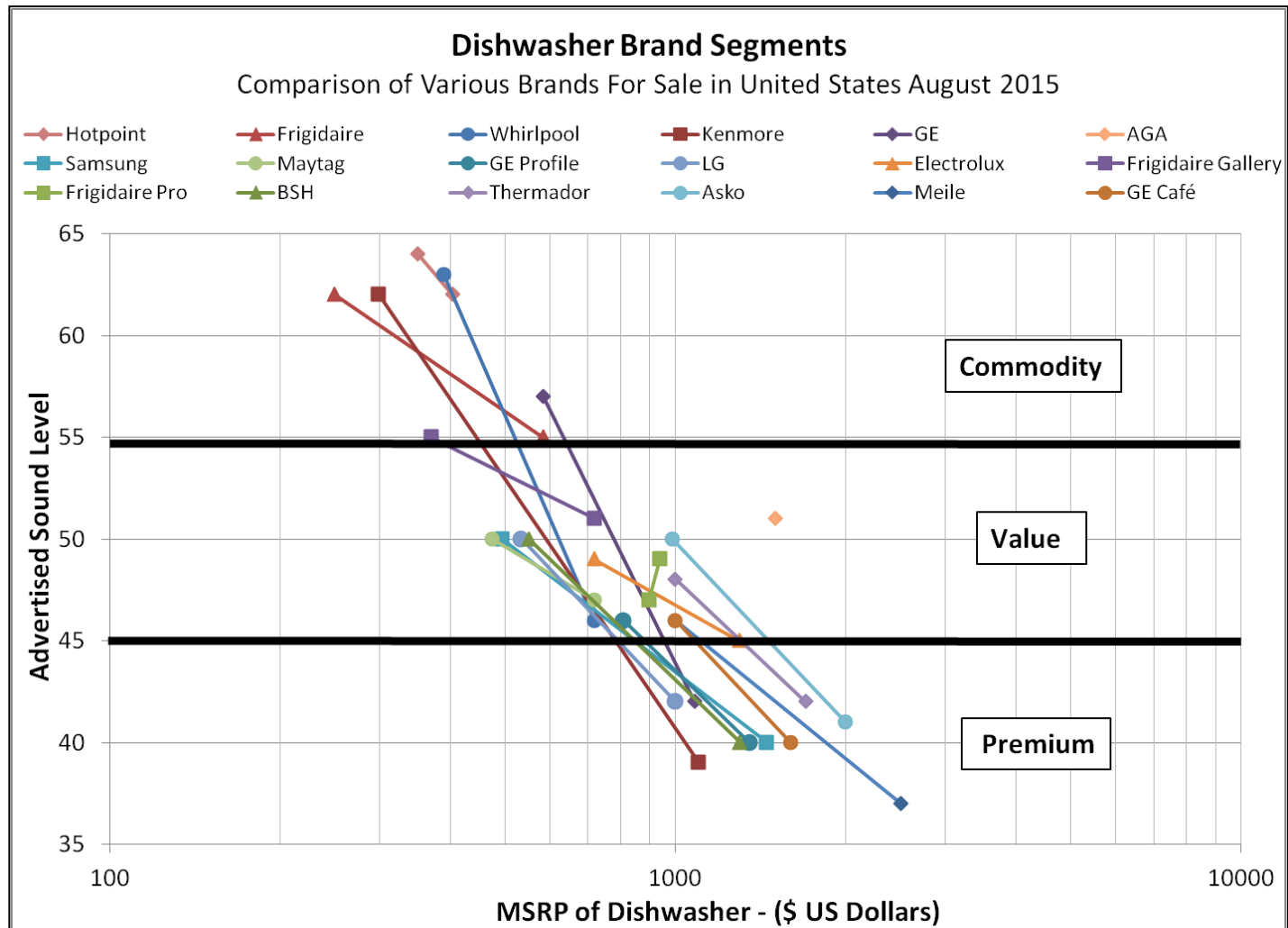
- **Reliable and easy applicable (cheap) noise emission measurement methods**
- **Noise emission declarations from machine manufacturers which can be trusted and verified**
- **Easy accessible noise emission databases with a rigorous quality system**

2015 Dishwasher Sound Power Level

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)**
- **Measured in ISO 3745 laboratory**

2015 Dishwasher Sound Power Level



Dishwasher data available at retail stores in US

The screenshot displays a retail website's product page for built-in dishwashers. The page is divided into several sections:

- Navigation:** Includes logos for Best Buy, Lowe's, and Sears, along with breadcrumb trails like "Home > Appliances > Dishwashers".
- Filters (Left Column):** A vertical list of filter categories including Current Offers, Brand, Width (Approx), Features, Primary Finish Color, Customer Rating, Condition, Price, Control Type, Tub Finish, and Operating Sound Level.
- Filter Details (Middle Column):** Expands the "Operating Sound Level" filter into a "Sound Rating Range (Decibels)" section with options: Average 61 DBA And Up (31), Quiet 56-60 DBA (21), Quieter 51-55 DBA (78), and Quietest 0-50 DBA (106).
- Filter Details (Right Column):** Expands the "Dishwasher Sound Rating (Decibels)" filter into a "Dishwasher Sound Rating (Decibels)" section with options: 0 - 44.99 (55), 45 - 49.99 (82), 50 - 54.99 (56), 55 - 59.99 (33), and 60+ (36).
- Product Listings (Right Column):** Shows a "Built-In Dishwasher" product with a "Kenmore ELITE" badge. Below it, "Related Categories" include Appliance Supply Lines & Drain Hoses (122), Built-In Microwaves (16), Kitchen Brushes (15), and Kitchen Cleaners (96). A "Refine Results" section lists filters for Brand, Appliance Color/Finish, and Cycles. A "Refine Your Search" section includes filters for Brand, Color Family, Price, Control Location, Width, Height, Decibel Range, Common Dishwasher Size, Actual Dishwasher Height (Inches), Tub Material, and Price.

Thank you!

Questions?