Chemical Management and Supply Chain Communication in the Automotive Industry

Tools and Processes

Timo Unger

HYUNDAI Drive your way

KIA MOTORS The Power to Surprise

European Auto Industry is the "engine" of Europe

An industry crucial for economy…

16.2 million vehicles produced in 2013	Over €32.3 billion in R&D spending, largest private investor	€95 billion of net trade contribution	€388.8 billion of tax revenues (EU 15)

… and employment

- **12.7 million direct and indirect jobs**

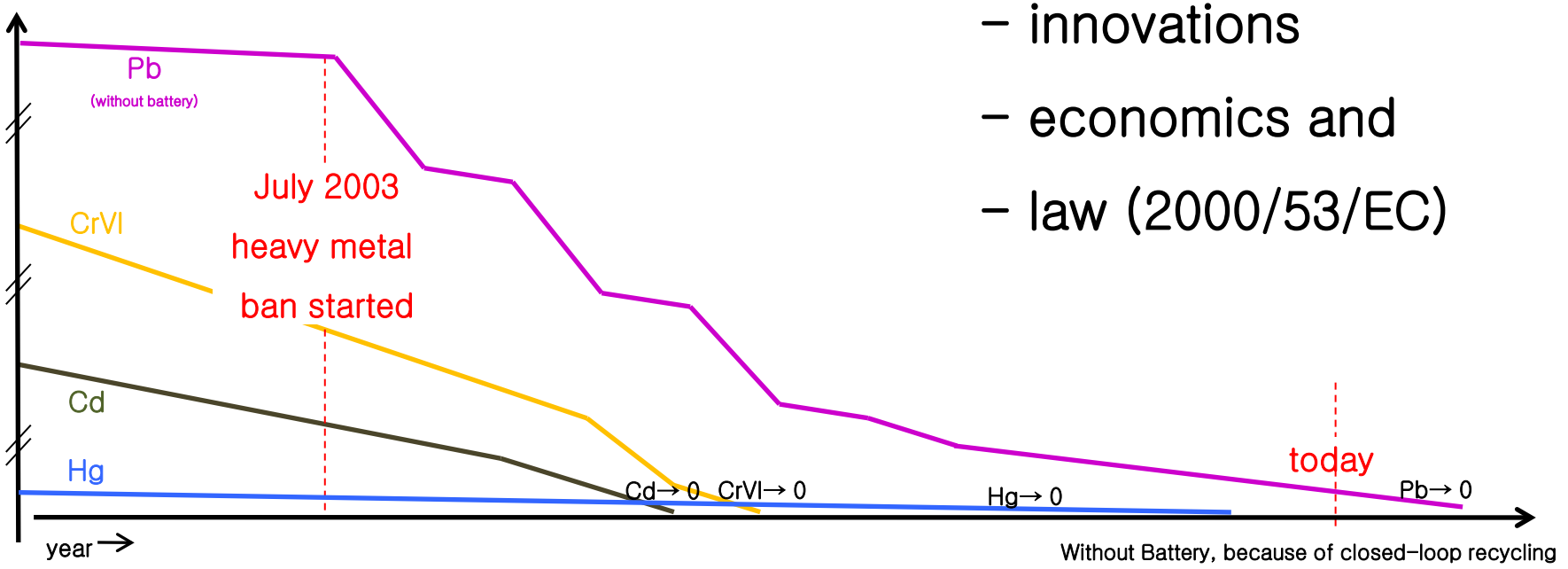
The vehicle is a very special product

- Most regulated by authorities
  - > 75 product laws directly influense ist caracteristics
  - > 300 indirect laws
- Most advanced state of the art processes
  - For Global Engineering and R&D
  - For purchasing (e.g. purchasing guidlines, terms and conditions, supplier evaluation, supplier quality control, vendor tooling)
  - For Quality (e.g. release process for production/PPAP)
  - For logistics (e.g. supply risk management,
  - For production (e.g. closed loop/no waste for land fill, solar power supply etc.)
  - For end of life management
- Most complex product (> 1.000 functionalities)

Phase out of Lead, Chromium (VI), Cadmium and Mercury

triggered by

- technology
- fuctional changes
- innovations
- economics and
- law (2000/53/EC)

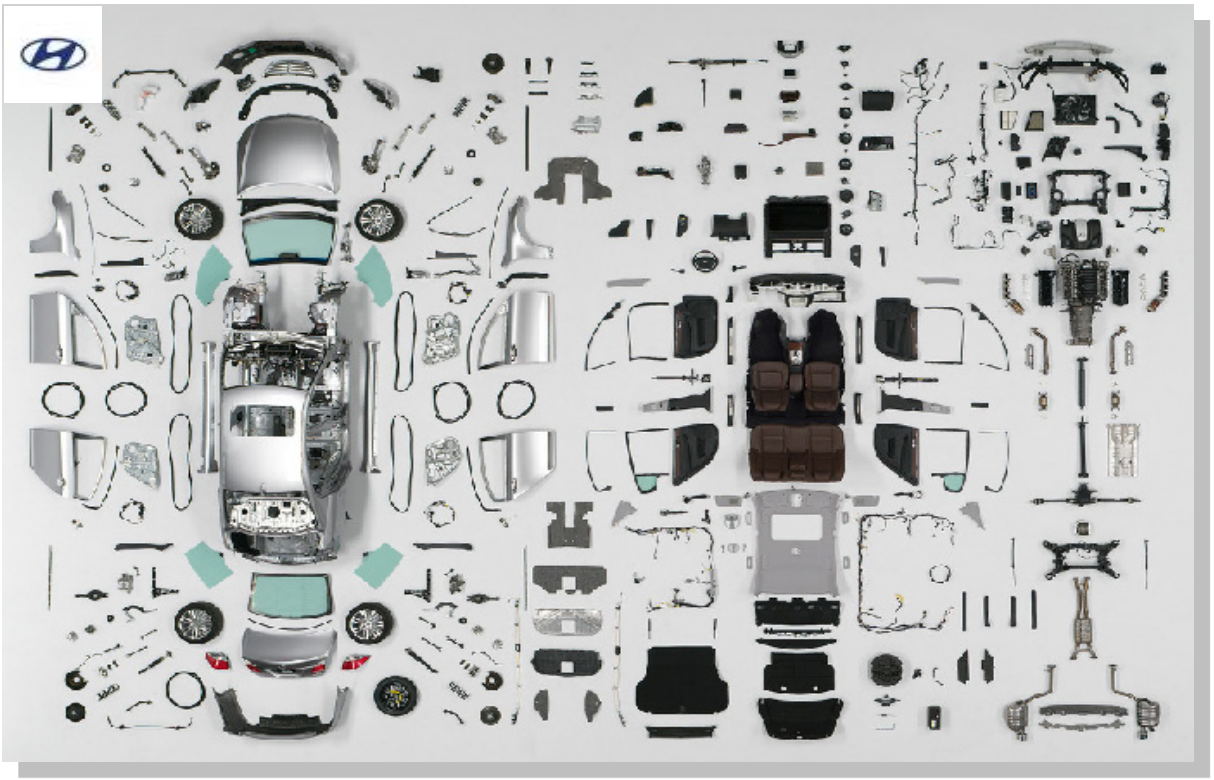


2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
ELV Directive with 1st annex II started		1st revison annex II	Start Heavy Metal ban		2nd revision annex II			3. revision annex II	4. revision annex II		5. revision annex II	6. revision annex II		7. revision annex II	8. revision annex II	

- All involved parties can use IMDS via internet.
- IMDS is free of charge for the supply chain.
- Data security is ensured by user and transaction-related security architecture.
- Within the supply chain, material data can be forwarded in real-time according to authorization rights.
- The material data remains in possession of the creator who grants using rights to specific receivers.
- The system undergoes continuous improvements and enhancements to fulfil new requirements.

How many parts a vehicle contains?

- Depending on the complexity, there are between 4.000 & 9.000 different main components contained in a vehicle platform (without multiple entries for one specific part).
  - e.g. The vehicle platform of one OEM contains 8.400 components (=28.000 incl. common parts) from 1.800 suppliers!
  - Up to 75% of a car are pre-manufactured by supply chain



Total number of components assembled to one vehicle: up to 28.000
(example: 1 tire = 1 part reference number; number of tires per vehicle = 4)

Products from other industries may be even more complex!
(e.g. aerospace, engineering industry)

- A car radio is counted as one main component...

Considering all parts contained in all components and sub-components, we come to many tens/hundreds of thousands of articles per vehicle!

Other interesting figures…

- How many different part numbers a vehicle manufacturer has in its warehouse?

  up to 500.000

- How many parts supplier (Tier 1) does a vehicle manufacturer have?

  1.500 to 4.500

- and how many Tier 2 suppliers the Tier 1 has in average?

  500 to 1.500

- How many Tier 1 suppliers are coming from outside Europe?

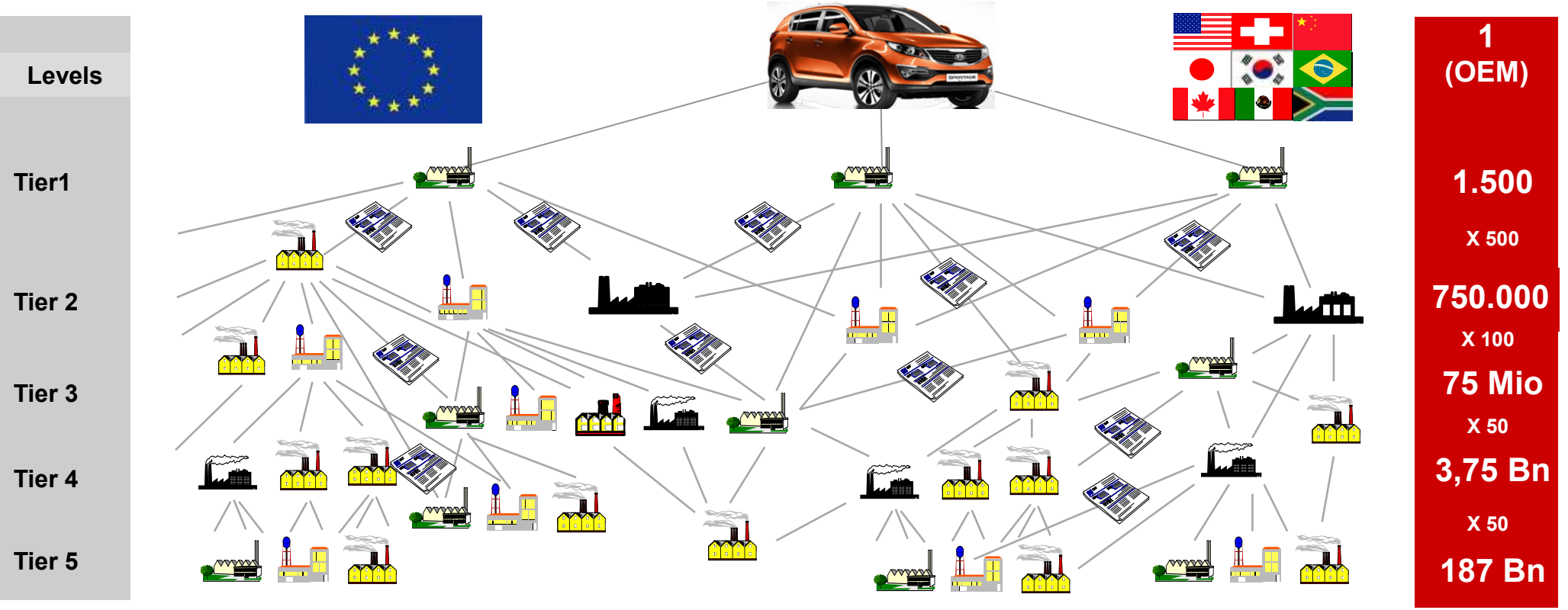
  20% to 30% (from European Vehicle Manufacturers)

  50% to 80% (from non-EU Vehicle Manufacturers)

- How many levels the supply chain in the Automotive Industry has?

  3-7 levels

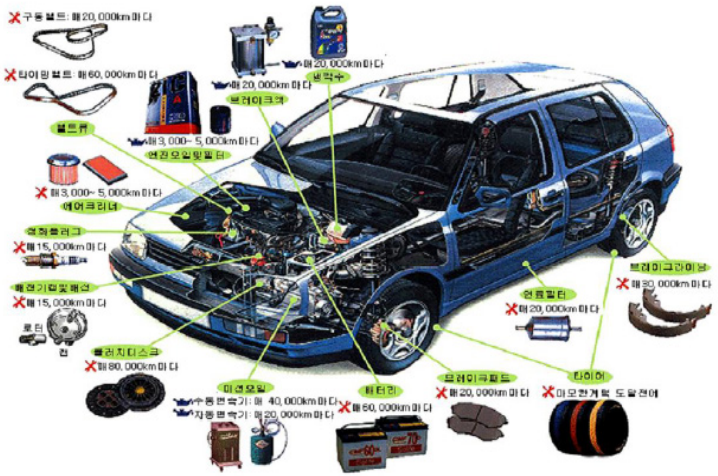
The Challenge of Supply Chain Communication



Using this data and adding some conservative assumptions a number of several billion possible substance communications for the tens of thousands of parts per vehicle are generated.

Achieving 100% complete data is impossible

From Paper to Electronic Data



Challenges

- Efficient management of a huge amount of data
- Easy overview on chemicals in parts
- Quick feedback and effective communication between suppliers and OEMs

Target

Fulfillment of legal & quality requirements with lowest effort

In 1999, VDA BOD decided to develop one common collection tool

Web based

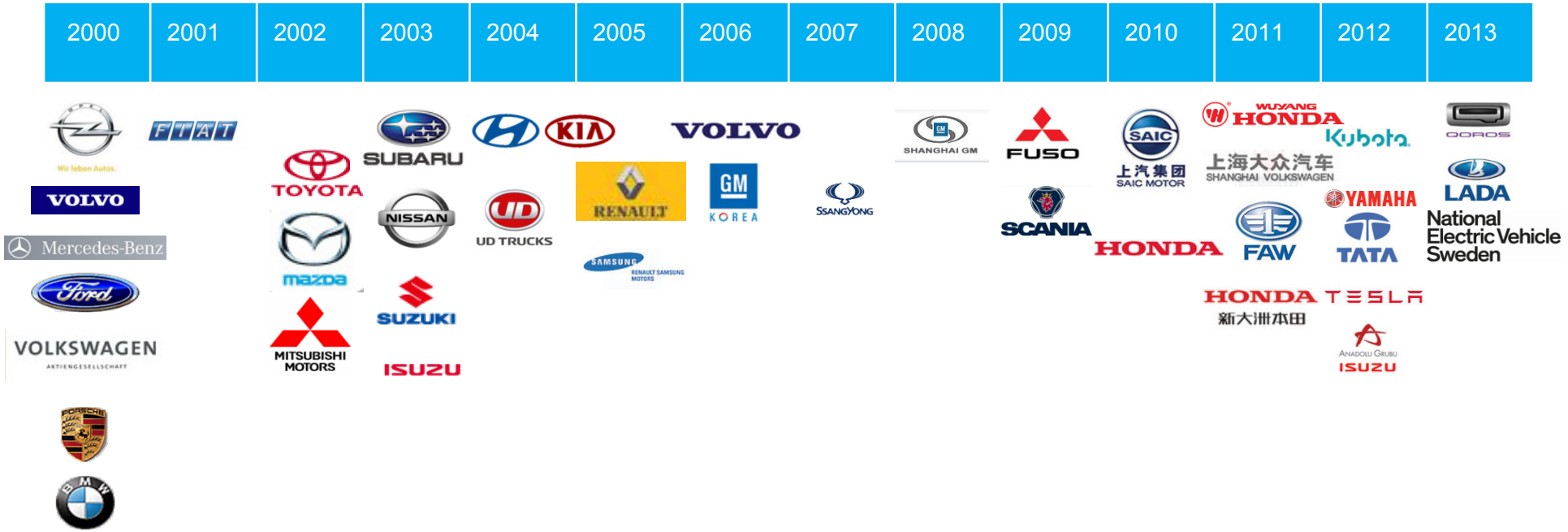
Standardized

Computerization

Quantitative report

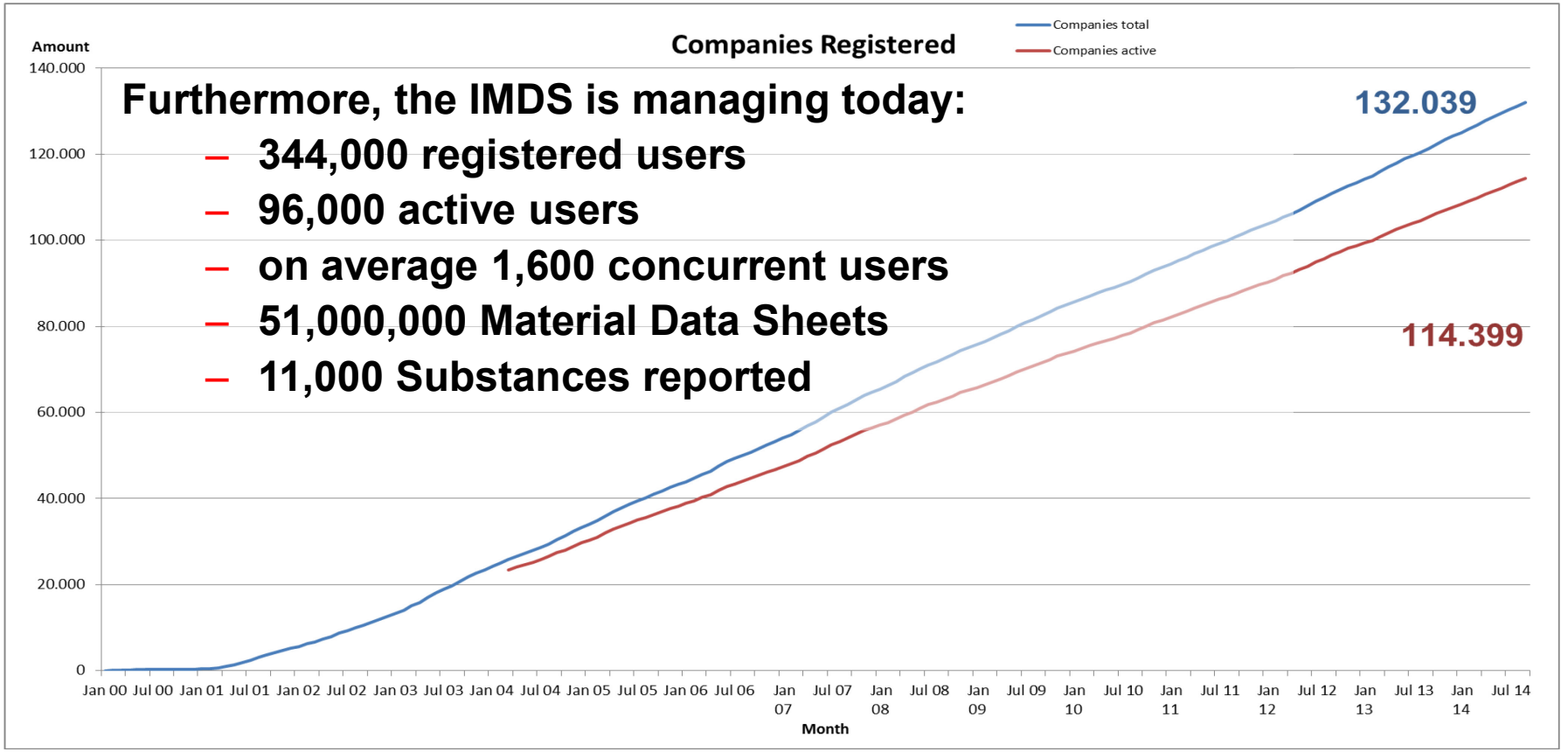
IMDS (International Material Data System)

IMDS – A global standard

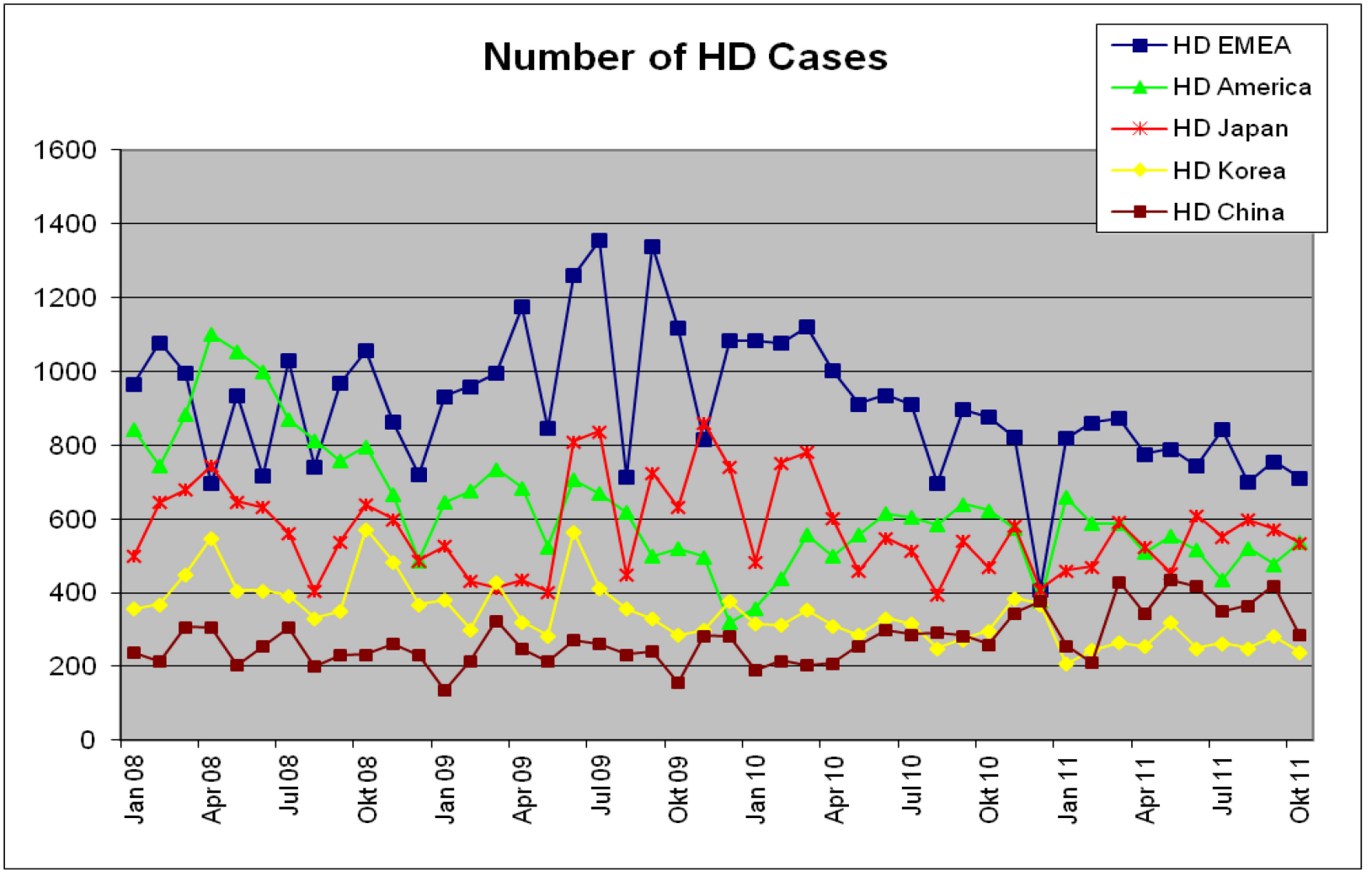


www.mdsystem.com

Companies registered

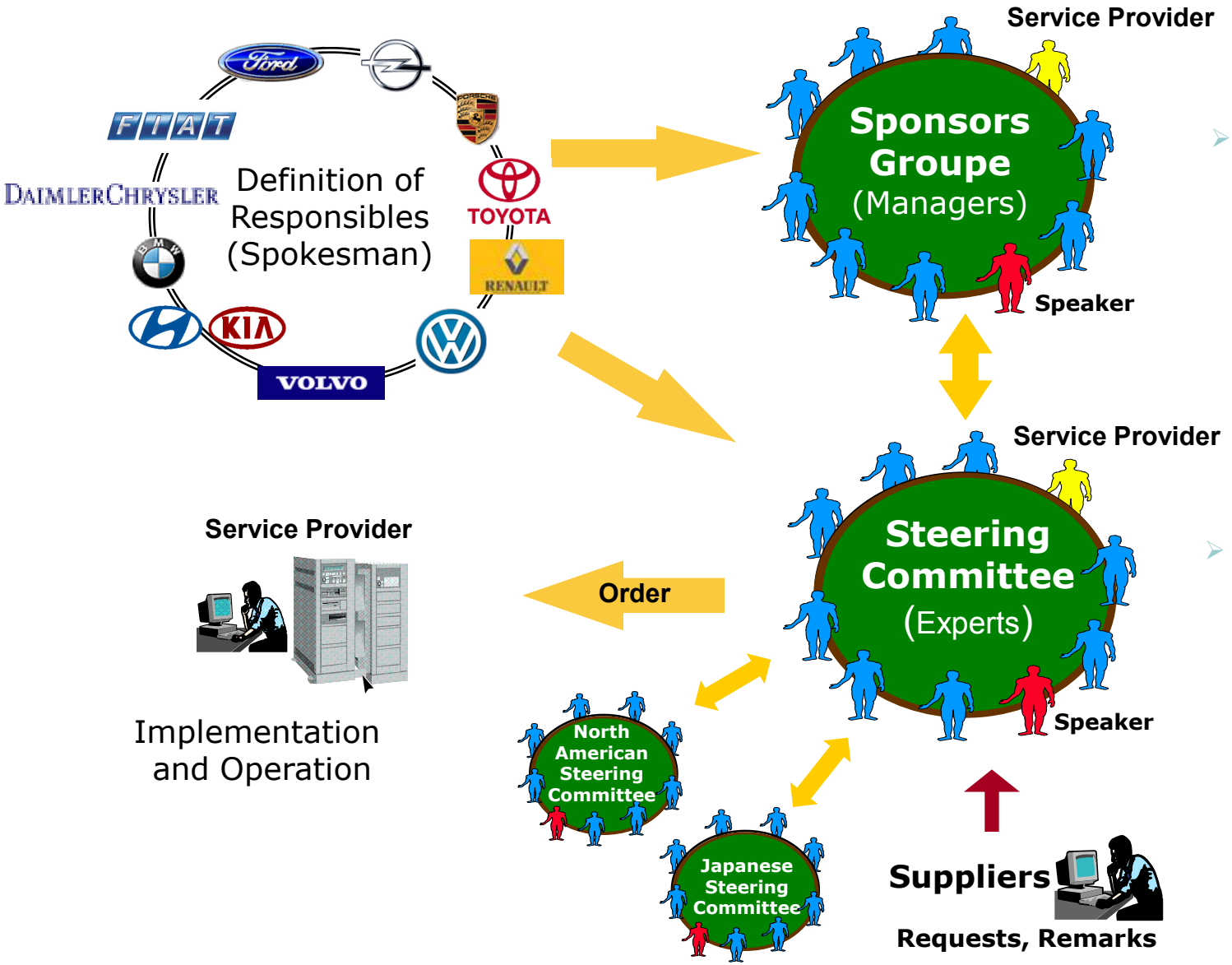


Helpdesk per Region since 2008



Source: HP / IMDS SC

How the IMDS is managed?



Tasks:

- Strategy & Costs
- Operational Execution

Main Principle of Data Collection

Within the whole supply chain, each supplier has to enter the substance & material information for his component and send it to the IMDS-account of his customer

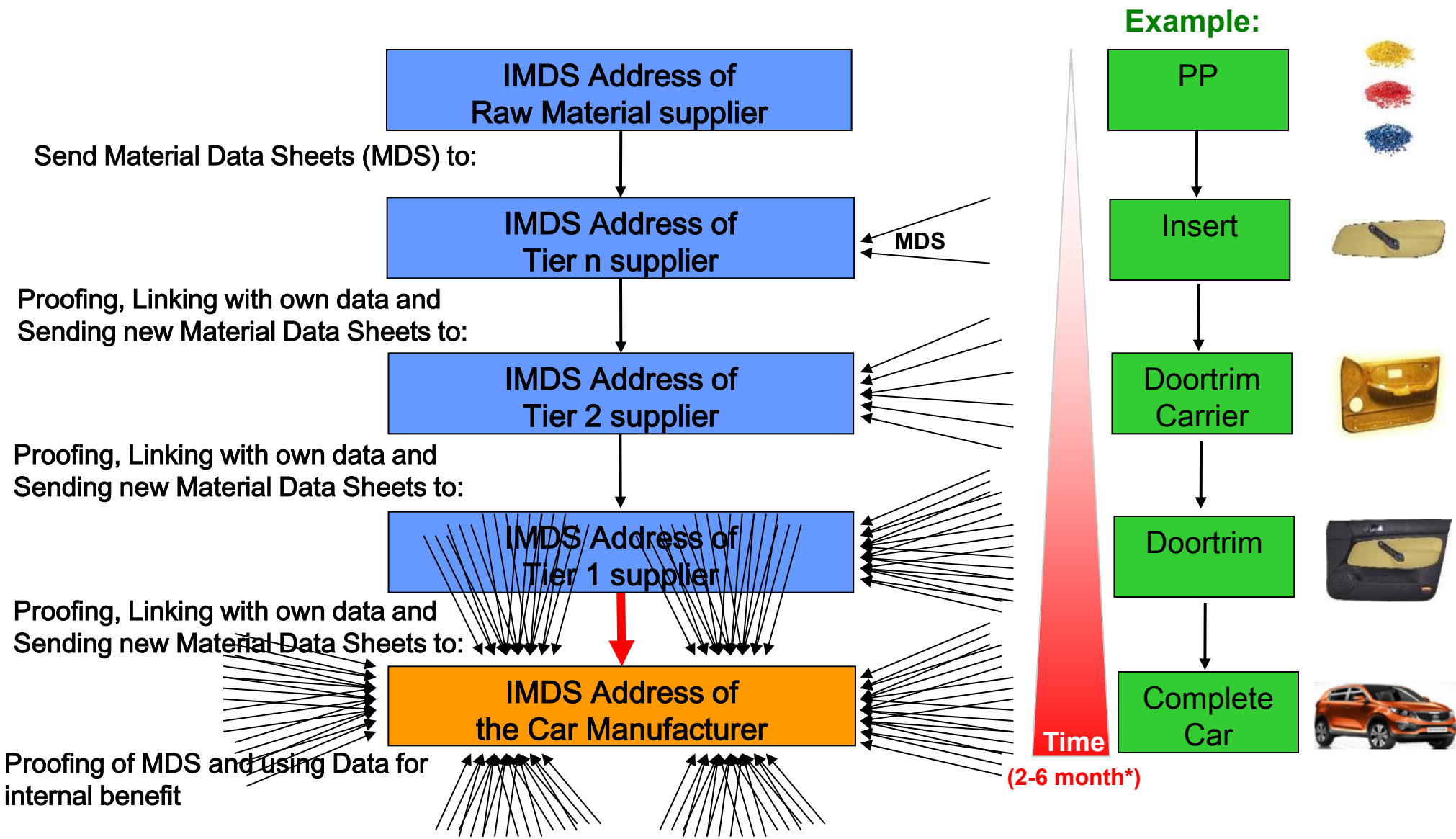
At the end, a more or less complex "Material Data Sheet" will be send from the Tier 1 Supplier to the car manufacturer (OEM)

The OEM is using the data to check compliance of the purchased parts and substances for internal requirements as well as legal obligations

- Each level of the chain can (and is) using the data to **check and proof compliance**
- **Data ownership (and responsibility) is on data creator** site. Data **cannot be modified by the reciever** (without generating a new version (Data ID))
- By granting up to 10% Jokers in the reported data, **CBI protection is achieved and fully accepted** by the global chemical Industrie. (coverage of secret amounts of the recipie)

- **Key to success:**
  No accepted IMDS Data = No parts approval = No payment = No production

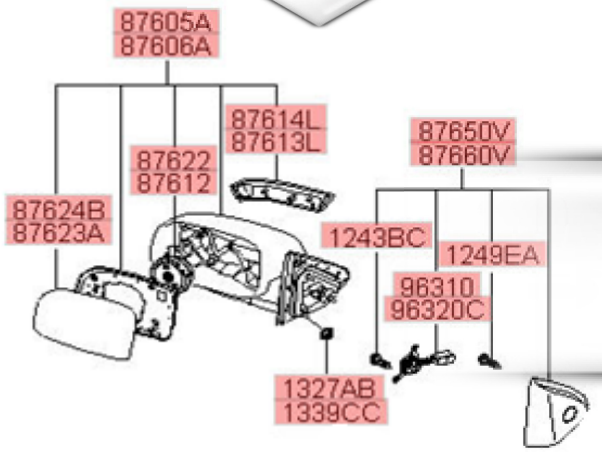
A data flow throughout the full supply-chain



* Estimate of a real data collection.
Depending on the complexity of the part &
the strategy of the vehicle manufacturer (PPAP).

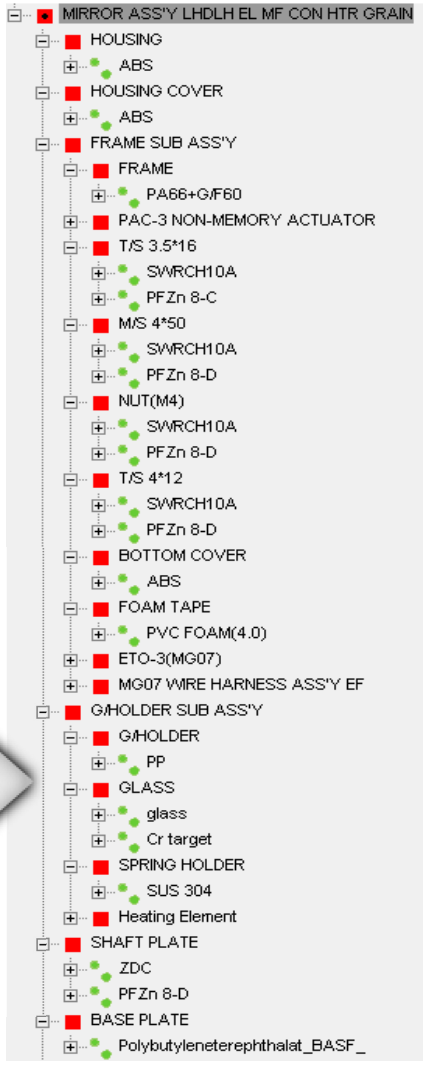
From drawings to IMDS data

Real Part



Bill of Material (BOM) / Drawing

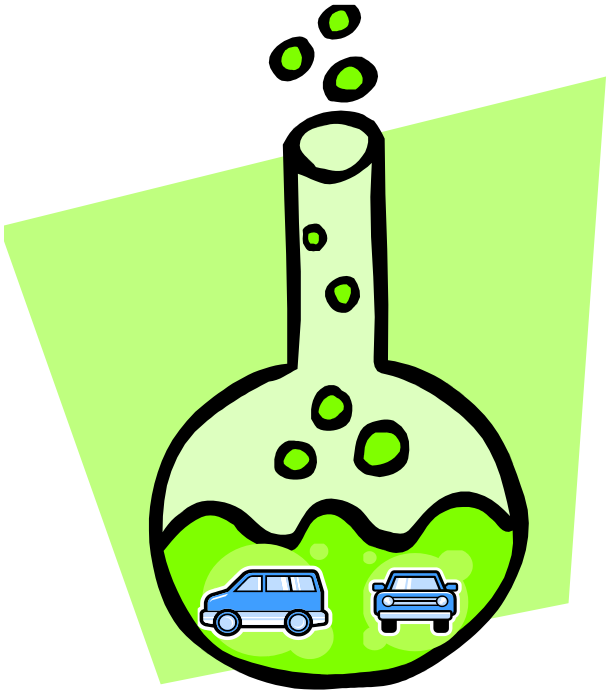
Data in IMDS



- **Structure of a part (according to BOM)**
- **Used materials (incl. material categories)**
- **Weights of the components and materials**
- **Substances (esp. all substances of concern)**
- **Concentration of the substances within materials**

Not included in IMDS

In IMDS, only substances have to be reported that are contained in the final part and that exceed the impurity threshold of 0,1%/(0,01%).



e.g.: No Polyol and no Isocyanate but only Polyurethane (PUR)

IMPORTANT:

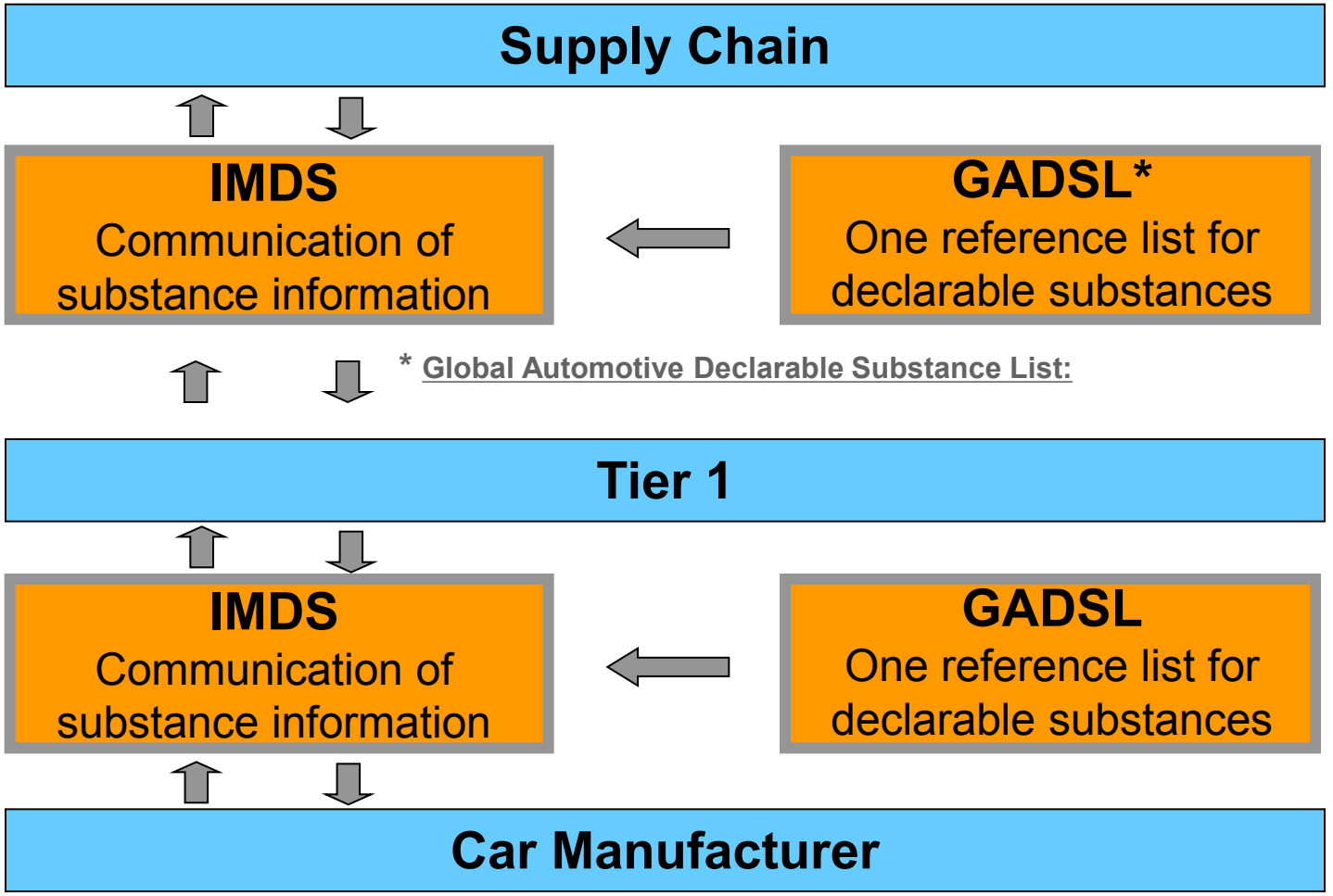
No other substances, e.g. used for:

- Production  e.g.: Release Agents, Cleaning Agents
- Packaging  e.g.: Transport Boxes, Paper, Plastic Foil
- Transport  e.g.: Fuel, Containers

…have to be entered into the IMDS
(except they are still available on the final part)

The general process of CiP reporting in the AI

Since many years a standard process within the Automotive Industry



- The whole reporting and analysis is based on CAS numbers
- **Golden Rule:** If a substance is listed on GADSL, it must not be hidden (Jokers) in the IMDS reporting / substance declaration

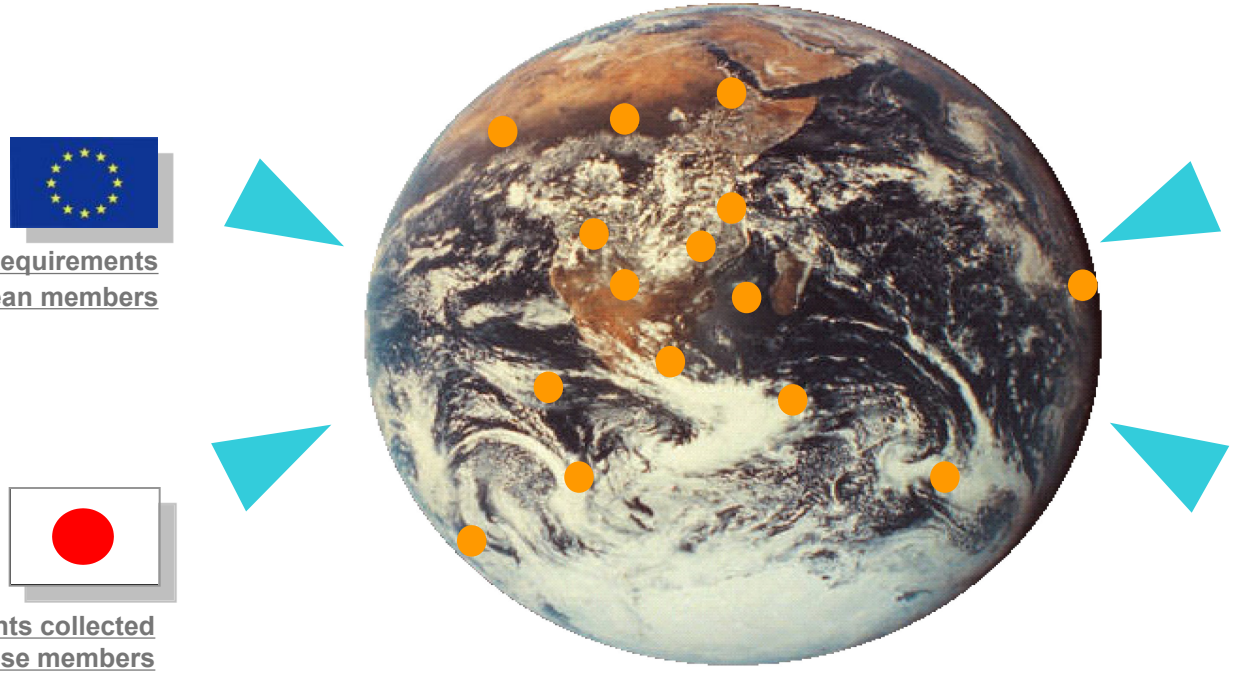
GADSL – A short insight

- The sources to analyze, evaluate and finally decide are
  - The know how of the GASG Group (Decades of experiences!!!)
  - In addition and with minor impact, information from IMDS (has this substance already been used within a vehicle)

	Substance	CAS-No.	Classi-fication	Reason Code	Source (Legal requirements, regulations)	Generic examples	Reporting threshold (0,1% unless otherwise stated)	First added	Last Revised
1	**Acetaldehyde**	75-07-0	D	FI	Reg. (EC) No 1272/2008	Emitted substance from polymer components		10-Jan-05	
2	**Acetamide**	60-35-5	D	FI	Reg. (EC) No 1272/2008	Solvent additive, stabilizer for softening agents		10-Jan-05	
3	**Acetamide, N-methyl-**	79-16-3	D	FI	Reg. (EC) No 1272/2008, Classified as toxic to reproduction class 2		0,10%	1-Feb-10	
4	**Acetonitrile**	75-05-8	D	FI	Reg. (EC) No 1272/2008	component in high-capacity capacitors		1-Feb-08	
5	**Acrylamide**	79-06-1	D	FI	Reg. (EC) No 1272/2008	Production of polyacrylamide (residual monomer)		10-Jan-05	
6	**Acrylonitrile**	107-13-1	D	FI	Reg. (EC) No 1272/2008	Production of plastics, resins and rubbers eg. ABS (residual monomer)		10-Jan-05	
7	**Amines, carcinogenic, which are formed from Azo-dyes, selected**		P	LR	Reg. (EC) No 552/2009	In dyes for textiles etc.	The list of affected Azo-dyes is continuously updated at: List B: Auf dem Weltmarkt nicht erhältlich (are not allowed) http://www.vci.de/template_downloads/tmp_VCI Internet/AzoTR614~DokNr~115196~p~101.pdf	10-Jan-05	29-Jan-08
	2,4,5-Trimethylaniline	137-17-7	P	LR	TRGS 614			10-Jan-05	
	2-Naphthylamine	91-59-8	P	LR				10-Jan-05	
	3,3'-Dichlorbenzidine	91-94-1	P	LR				10-Jan-05	
	3,3'-Dimethoxybenzidine	119-90-4	P	LR				10-Jan-05	
	3,3'-Dimethylbenzidine	119-93-7	P	LR				10-Jan-05	
	4,4'-Methylene-bis-(2-chloroaniline)	101-14-4	P	LR				10-Jan-05	
	4,4'-Methylenedianiline	101-77-9	P	LR				10-Jan-05	
	4,4'-Methylenedi-o-toluidine	838-88-0	P	LR				10-Jan-05	
	4,4'-Oxydianiline	101-80-4	P	LR				10-Jan-05	
	4,4'-Thiodianiline	139-65-1	P	LR				10-Jan-05	
	4-Aminodiphenyl	92-67-1	P	LR				10-Jan-05	
	4-Chloraniline	106-47-8	P	LR				10-Jan-05	
	4-Chloro-o-toluidine	95-69-2	P	LR				10-Jan-05	
	4-Methoxy-m-phenylenediamine	615-05-4	P	LR				10-Jan-05	
	4-Methyl-m-phenylendiamine	95-80-7	P	LR				10-Jan-05	
	5-Nitro-o-toluidine	99-55-8	P	LR				10-Jan-05	
	Benzidine	92-87-5	P	LR				10-Jan-05	
	o-Aminoazotoluene	97-56-3	P	LR				10-Jan-05	
	o-Anisidine	90-04-0	P	LR				10-Jan-05	
	o-Toluidine	95-53-4	P	LR				10-Jan-05	
	p-Cresidine	120-71-8	P	LR				10-Jan-05	
	4-Aminoazobenzol	60-09-3	P	LR				1-Feb-09	
8	**Amines, which can form carcinogenic Nitrosamines, selected**		D	FI	Legally regulated according to german TRGS 615. Limit for all secondary Amines in volatile corrosion inhibitors, which can form carcinogenic Nitrosamines. Volatile corrosion inhibitors include papers, plastic films and oils.	polyurethane foams, corrosion inhibitors, lubricants, rubber, colourants, herbicides		1-Feb-06	

GADSL today includes:

- 2703 Substances (CAS numbers) in
- 132 Substance Groups



European- Requirements collected by European members

Korean- Requirements collected by Korean members

Japanese- Requirements collected by Japanese members

US- Requirements collected by US members

www.gadsl.org

Considering the following criteria:

- Substance is to be expected in automobile part or vehicle
  (NOT in the production process and not outside the Automotive Industry!)
- Substance is regulated or projected to be regulated
- Reportable threshold levels will be based on the lowest level required by regulation or scientific evaluation.

IMDS & Confidentiality

- IMDS allows manufacturers of materials (Polymers, Greases, …) to keep a certain amount of their formulation (max. 10%) confidential by providing:
  - Jokers/Wildcards, (e.g. “further additives”, “miscellaneous, not to declare, …)

- However, this option must only be used if the core rule of IMDS is fulfilled
  - No substances listed on GADSL must be hidden in a wildcard
  - In case of a GADSL update (new “legal” requirement (e.g. new substances on the ROI, new Annex XV Dossier for restriction, amended ELV Annex II, …)) the supplier has to check ALL of its MDS and if needed re-submit those were the new GADSL substance was covered by a joker.

  NOTE: If the supplier does not follow this rule he is violating both, his legal requirement (e.g. REACH Art 33) AND the contracts with his customers

IMDS Security Management at HP

Secure HP Infrastructure

- Regulatory Compliance — HP is accredited by regulatory bodies to achieve compliance and support our clients meeting their compliance responsibilities
- Physical Security — examples are control access to facilities, security badges, and escorted visitors
- Virtual Security — examples are controlled system access, server auditing/scanning, and firewall management

Additional Services are tailored to needs

- Identity and Access Management — enables entitlement-based access to enterprise online applications and resources
- Threat and Vulnerability — employs a layered strategy to securing IT infrastructure and data assets
- IT Security Management — manages, monitors, captures, tracks, stores, and resolves security events from a centralized SIM repository
- IT Security Compliance — provides a proactive risk management program that supports client regulat ory and policy directives
- Secure Communications — enables secure access to information and tools across the enterprise
- Secure Content — protects confidential corporate information and data assets through encryption of data on disks, attached devices, and backup media

→ ensures system security and protection of users' IP

Strong and weak points of these processes and tools

- Well established process in the whole automotive sector (Global Standard)
  - Suppliers can address many customers with the same solution
- Well trained supply chain
- Broadly accepted by chemical industry (CBI protection)
- Comprehensive overview on substances used in cars
- Known and accepted by global legislators (Simplified Compliance Audits)
- Reporting by the one with most knowledge (Substance, Material or Part producer)
- Cost free for supply chain
- …

1. KNOW

Basic

- Create or use a CoC List ✓
- Supplier contracts to stipulate reporting ✓
- Create a CiP information system ✓
- Prepare safe handling, use and disposal docs ✓
- Provide supplier and company internal trainings ✓
- Publish Internal point of contact ✓

Additional

- Develop expanded CoC list ✓
- Identify pathways of critical impurities ✗
- Receive from supplier SoC Inventories ✓
- Inform downstream users about SoCs ✓

High Level

- Acceptable chemicals lists ✗
- Inventory of ALL chemicals ✗

2. DISCLOSE

Basic

- Issue Corporate statement on disclosing CiP Infos ✓
- Publish Chemicals of Concern List ✓
- Disclosure Gov. & DUs and final consumers about CoCs in products ✗
- Point of contact for inquiries ✓
- Disclosure of waste handling information ✓

Additional

- Disclose Expanded Chemicals of Concern list ✓
- Transparency of process and evidence ✓

High Level

- Disclosure of all chemicals in final product ✗

3. ENSURE

Basic

- Update CoC List as often as possible ✓
- Laboratory verification of supplier reporting´s ✗
- Ensure that hazard and risk information can be understood by a lay person ✓

High Level

- Conduct spot checks for compliance ✓

CONCLUSION:

- **All industries are different**
  => Things working in our world can fail in others...
- **There are CiP objectives which are achievable.**
  => But there are also others which –if insited in- can result in an industry boykott...
- **Prerequisite for success: Common agreement on the CiP objectives**

Collection of CiP Information is a challenge

...if it continous to be visionable, it will remain a vision

but if it´s made workable, it will work!!!