

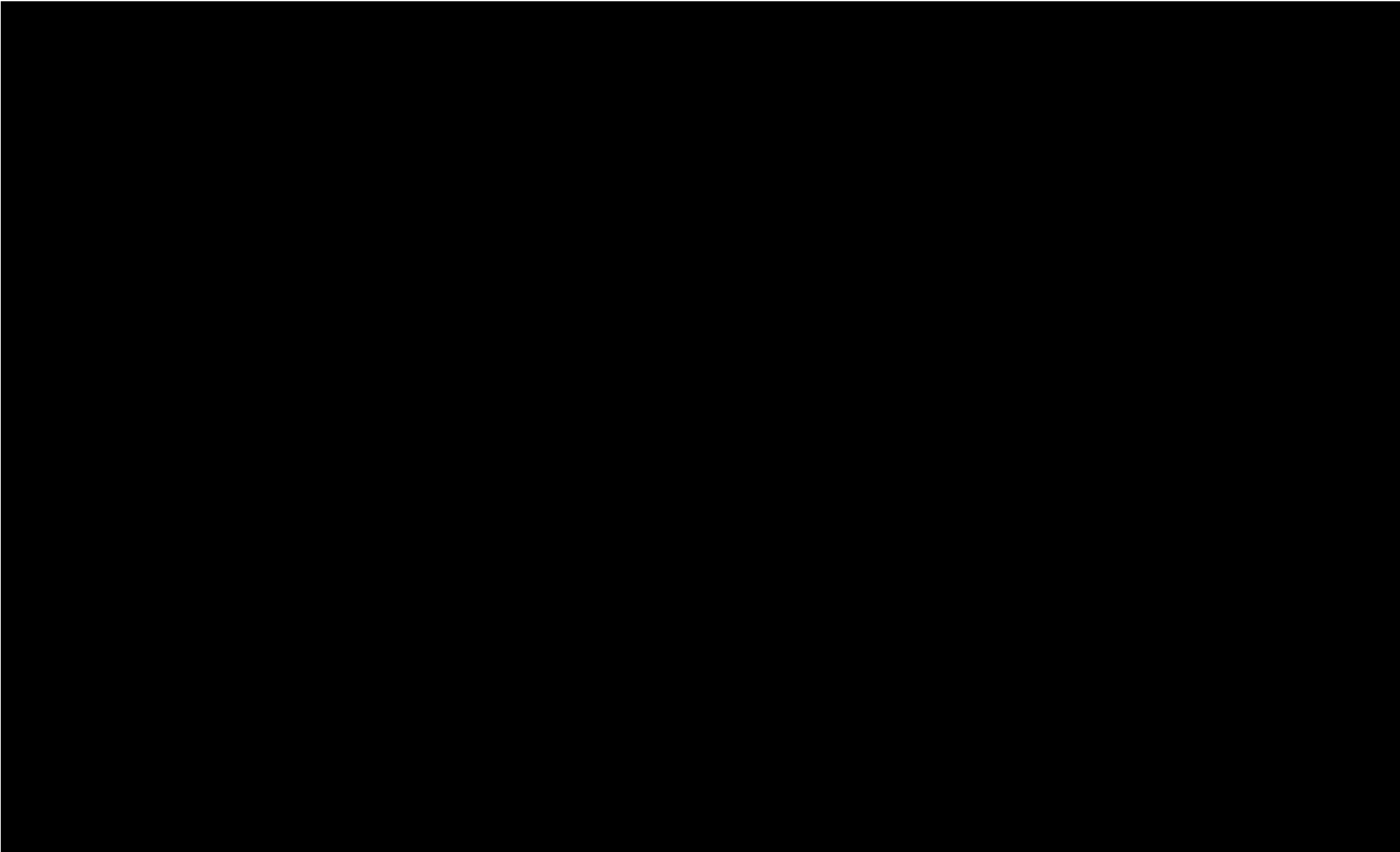


Jotun GreenSteps

TOWARDS A MORE COLOURFUL WORLD



Jotun Protects Property



For a more colourful world,
we're taking steps
to be a little greener.



Reducing
VOC emissions



Reducing
hazardous
material



Reducing
energy
consumption



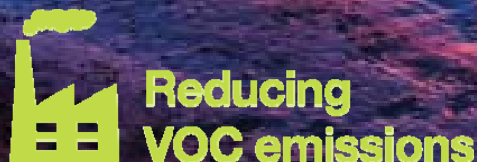
Reducing
carbon
footprint



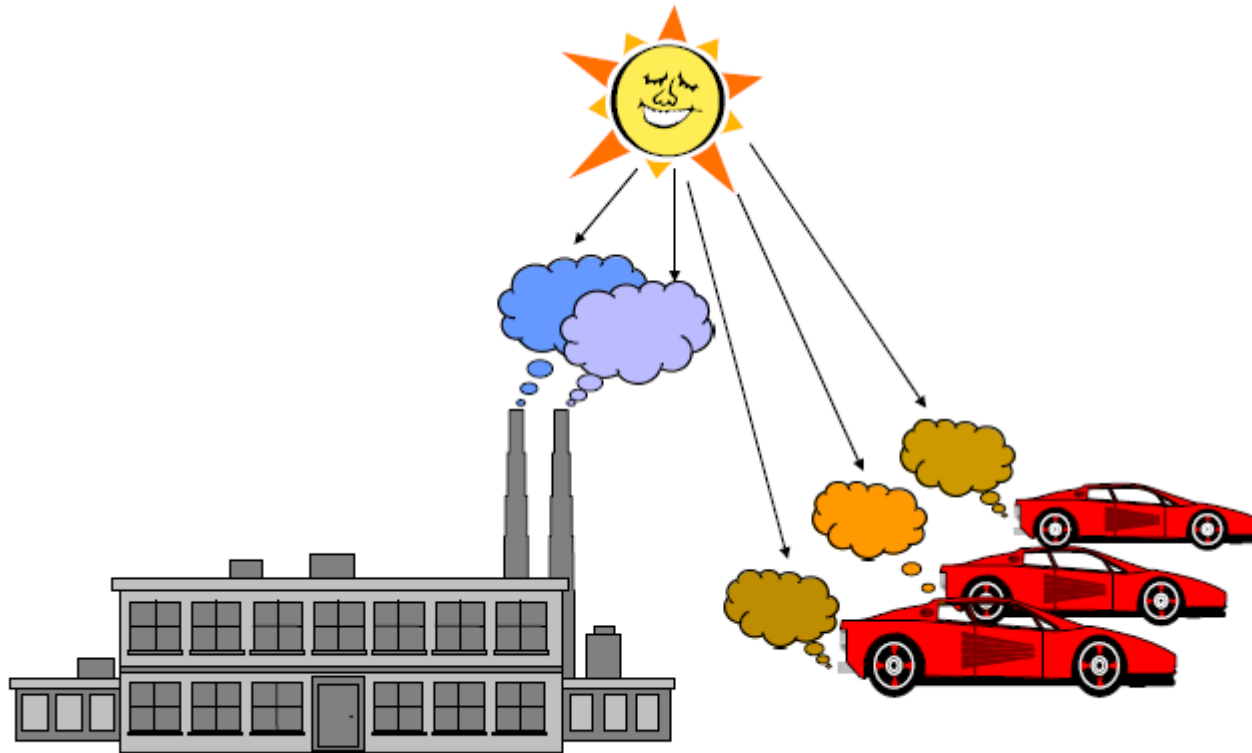
Reducing
waste

Less VOC emission, maximum protection

- Meet the the highest product quality and reliability
- Protecting environment, protecting property



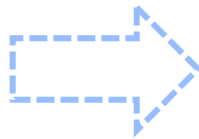
$\text{NO}_x + \text{VOC} = \text{OZONE}$



VOC Harm

- **Volatile organic compounds (VOCs)**, Many VOCs are dangerous to human health or cause harm to the environment. VOCs are numerous, varied, and ubiquitous
- In 2011, 4.32 million tons organic solvents are used in coatings industry, which account 14.4% of China VOC emission.

- Aliphatic hydrocarbons
- Ethyl acetate
- Glycol ethers
- Acetone
- Styrene
- Limonene
-



- Cancer
- Eye irritation
- Respiratory irritation
- Headaches
- Dizziness,
- Memory impairment

VOC Regulation

序号	法律法规	主要内容
1	欧盟1999/13/EC	限制一定的活动和设备安装中使用的VOC挥发
2	欧盟：2004/42/EC	限制油漆、室内、车内装饰中的VOC挥发
3	美国：40 CFR 63 subpart II	限制油漆、黏结剂、溶 剂、木业胶水中VOC R RPL V
4	ECMA-328	欧洲电脑制造协会规定的电子产品VOC含量
5	2002/231/EC	鞋类：油漆包装上加强制性标签标明VOC的逸散量
6	加拿大建筑涂料	49种建筑涂料的VOC限量，并将适用于制造、进口、提供销售或在加拿大销售的普通建筑物、高性能工业维修和交通标志涂料

VOC Limitation in the U.S. (g/L)

Coating	SCAQMD 美国南岸区	CARB 加利福尼亚	OTC 东北12州	EPA& 其他州
Architectural & maintenance	100	250	340	450
Flooring	50	250	340	400
waterproof binder	100	250	250	600
primer	100	200	200	350

MPI green performance standards

Category Description	Max. allowable VOCs, g / L	Category Description	Max. allowable VOCs, g / L
Clear varnishes	350	Multi-color coatings	250
clear lacquer	350	Pretreatment wash primer	420
Fire retardant-pigmented	350	Quick dry enamels	200
Fire retardant -clear	650	Quick dry enamels	250
Floor coatings	250	Traffic coatings	150
Hi temperature coatings	420	Zinc rich primers	340
Industrial maintenance coatings	340		

HONGKONG

Air Pollution Control (VOC) regulations

g / L

项	受规管 建筑涂料	VOC 最高限值	项	受规管 建筑涂料	VOC 最高限值
1	透明木面涂料（清漆）	550	10	预处理蚀刻底漆	420
2	透明木面涂料（光油）	150	11	底漆、封固底剂及中层底漆	200
3	极高光金属涂料	420	12	快干磁漆	250
4	阻燃涂料（有色）	350	13	快干底漆、封固剂及中层底漆	200
5	地台涂料	350	14	防锈涂料	400
6	耐高温工业保养涂料	420	15	极耐用油性金属涂料	420
7	工业保养涂料	250	16	道路涂料	150
8	金属颜料涂料	500	17	防水封固剂	250
9	预处理金属涂料	420	18	富锌工业保养底漆	250

VOC Regulation in China

- GB 18581, 室内装饰装修材料溶剂型木器涂料中有害物质限量标准
- GB 24408, 建筑用外墙涂料中有害物质限量
- GB 18582, 室内装饰装修材料内墙涂料中有害物质限量
- GB 24409, 汽车涂料中有害物质限量
- HG/T 3828, 室内用水性木器漆涂料
- HJ/T 201, 室内用水性木器涂料
- GB 50325, 民用建筑工程室内环境污染控制规范
- GB/T XXXX, 水性汽车涂料
- HG/T XXXX, 水性多彩建筑涂料
- HG/T XXXX, 水性复合岩片仿花岗岩片涂料
- GB XXXX, 建筑钢结构涂料有害物质限量

GB XXXX, 建筑钢结构涂料有害物质限量

- VOC
- Heavy metal

Jotun Solution

- High volume solid coatings
- Solvent free coatings
- Waterborne coatings
- Powder coatings



Volume Solid & VOC

Primer & Mid-coat	Volume solid %	VOC g / L
Alkyd /CR/Epoxy	40-50%	>400
Epoxy	65%	300
Epoxy	74%	230
Epoxy	80%	180
Epoxy	87%	110

Volume Solid & VOC

Topcoat	Volume solid %	VOC g / L
Acrylic / CR	34%	560
Alkyd /PU/Fluo.	40%	530
Epoxy /PU	50%	410
Epoxy /PU	64%	310
Polysiloxane	76%	215

High Volume Solid Coatings



Volume Solid & VOC

Solvent Free	Volume solid %	VOC g / L
Epoxy SF	98%	30-40
Epoxy SF	100%	3

Volume Solid & VOC

Water borne	VOC g / L
Zinc rich epoxy	117
Epoxy primer/midcoat	73
Zinc silicate	0
Acrylic topcoat	119

Solvent Free Coatings, Waterborne Coatings



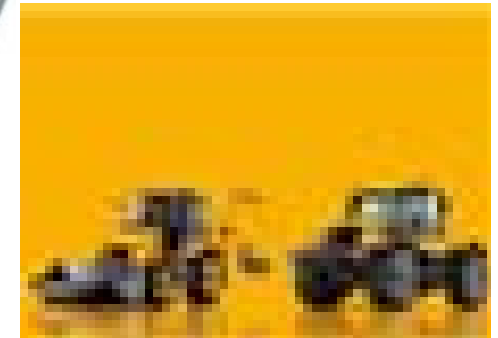
Powder Coatings



Architectural



Pipe



LESS HAZARDOUS MATERIALS

- Better products, for
- both of our customers and planet



Reducing
hazardous
material

Hazardous material

- PM 2.5
- Heavy metal
- Restrictive solvent
- Tar

Regulation

- RoHS(Restriction of Hazardous Substances)
- REACH: Regulation on 46 SVHC (substance of very high concern)
- LEED on building, USA

2011 高污染高环境风险产品目录

38	GHW/GHF	环烷酸铅
39	GHW/GHF	辛酸铅
40	GHW/GHF	异辛酸铅
41	GHW/GHF	硬脂酸铅
42	GHW/GHF	铅铬黄
43	GHW/GHF	钼铬红
44	GHW/GHF	铁蓝
45	GHW/GHF	二丁基二月桂酸锡
46	GHW/GHF	烷（壬）基酚聚氧乙烯醚（简称APEO）
47	GHW	醋酸铅
48	GHW	松香铅皂
49	GHW	碱式碳酸铅白
50	GHF	脱漆剂
51	GHW/GHF	一氧化铅
52	GHW/GHF	聚乙烯醇缩甲醛树脂的腻子与涂料
53	GHW/GHF	酸催化高含量三聚氰胺—甲醛树脂的木材涂料
54	GHW/GHF	含乙二醇醚及醚酯的聚酯树脂涂料
55	GHW/GHF	含乙二醇醚及醚酯的丙烯酸酯树脂涂料
56	GHW/GHF	含乙二醇醚及醚酯的聚氨酯树脂涂料
57	GHW/GHF	含乙二醇醚及醚酯的环氧树脂涂料
58	GHW/GHF	含有机锡防污涂料
59	GHW/GHF	含氧化亚铜防污涂料

2011 高污染高环境风险产品目录

60	GHW/GHF	VOC含量超75%的硝基纤维素涂料
61	GHW/GHF	VOC含量超75%的热塑性丙烯酸涂料
62	GHW/GHF	VOC含量超75%的氯化树脂涂料
63	GHW/GHF	高温热熔融成膜的不粘锅氟树脂涂料
64	GHW/GHF	高温热熔融成膜的厨具用防粘氟树脂涂料
65	GHW/GHF	高温热熔融成膜的食品机械防粘氟树脂涂
66	GHW	冷轧钢板表面钝化含铬处理剂
67	GHW	镀锌钢板表面钝化含铬处理剂
68	GHW	镉黄, CdS
69	GHW	镉红 n CdS、CdSe
70	GHW/GHF	挥发性过氯乙烯涂料
71	GHW/GHF	含邻苯二甲酸酯的玩具涂料
72	GHW/GHF	立德粉
73	GHW/GHF	含铅、铬的阴极电泳涂料
74	GHW/GHF	四氯化碳溶剂法生产的氯化橡胶树脂
75	GHW	硫酸法工艺（联产法清洁生产工艺除外）生产的钛白粉
76	GHW/GHF	高含量高羟甲基三聚氰胺—甲醛树脂交联的涂料
77	GHW/GHF	含十溴二苯醚的防火涂料
78	GHW/GHF	含八溴醚的防火涂料
79	GHW/GHF	含四溴二苯酚A的防火涂料
80	GHW/GHF	含六溴环十二烷的防火涂料
81	GHW/GHF	水包油型多彩内墙涂料
82	GHW/GHF	含放射性物质的荧光涂料
83	GHF	含异氰脲酸三缩水甘油酯的粉末涂料

NACE SP 0108 CORROSION CONTROL of Offshore Structure by Protective Coatings

Metal	Maximum wt%	Metal	Maximum wt%
Antimony	0.015	Mercury	0.0002
Arsenic	0.001	Molybdenum	0.35
Barium (excluding barite)	0.10	Nickel	0.02
Beryllium	0.0002	Selenium	0.001
Cadmium	0.0005	Silver	0.001
Chromium VI compounds	0.0005	Tantalum	0.10
Chromium or Chromium III compounds	0.56	Thallium	0.007
Copper	0.01	Tungsten	0.10
Lead	0.005 ^(a)	Vanadium	0.01

^(a) If the source of the lead is the zinc dust used in the zinc-rich primer, the maximum lead content in the zinc dust must be agreed to by the facility owner and the coating manufacturer. Four types of zinc dust are used in zinc-rich primers and each type has a different lead content.

Regulation in China

- GB 5369-2008, 船用饮水舱涂料通用技术条件
- GB 18581-2009, 室内装饰装修材料溶剂型木器涂料有害物质限量, LC<90 mg/kg
- GB 18582-2009, 室内装饰装修材料内墙涂料有害物质限量, LC<1000mg/kg
- GB 24408-2009, 建筑用外墙涂料 中有害物质限量, LC<1000mg/kg
- GB 24409-2009, 汽车涂料中有害物质限量, LC<1000 mg/kg
- GB 24410-2009, 室内装饰材料 水性木器涂料中有害物质限量,
- GB 24613-2009, 玩具用涂料中有害物质限量, lead<600mg/kg, chromium<60mg/kg
- GB/T 23994-2009, 与人体接触的消费产品用涂料中有害物质限量
- GB 30595, 环境空气质量标准, PM2.5
- GB XXXX, 建筑钢结构用涂料中有害物质限量, LC<1000mg/kg

Regulation in China

- GB 5369-2008, coatings for potable water,
- GB 18581-2009, solvent borne coatings for wood ware, LC<90 mg/kg
- GB 18582-2009, interior wall paint, LC<1000mg/kg
- GB 24408-2009, exterior wall paint, LC<1000mg/kg
- GB 24409-2009, auto coating, LC<1000 mg/kg
- GB 24410-2009, water borne coatings for wood ware,
- GB 24613-2009, coatings for toy, lead<600mg/kg, chromium<60mg/kg
- GB/T 23994-2009,
- GB XXXX, coatings for construction steel structures, LC<1000mg/kg

A famous crane manufacturer was forced to rework



No!



Key Challenge

- Low awareness on harm of heavy metal
- Passive attitude
- lack of regulation
- Higher price with organic colour pigment

ENERGY SAVING

- Possible ways to reduce energy
- Possibilities to customers
- Throughout products life cycles
- Throughout the whole value chains



**Reducing
energy
consumption**

LOWER CARBON FOOTPRINT

- Sourcing right raw materials
- Developing products and solutions with maximum durability



LESS WASTE

- Making our company as green as we can
- From the great efficiency of our plants
- Throughout products life cycles



Reducing
waste



Jotun GreenSteps

TOWARDS A MORE COLOURFUL WORLD



Jotun Protects Property