Vinyl pipe: safe delivery delivered safely

More than one-third of all vinyl produced is made into pipes, including pipes for municipal water delivery and wastewater removal, culverts and industrial piping systems. Vinyl pipes can have a long useful lifetime of up to 100 years or more, and like most vinyl construction products, require virtually no maintenance.

More important, vinyl pipes help to keep disinfected drinking water safe. They are much more resistant to the formation of microbial and bacterial growth that occurs along the interior walls of water distribution pipes. This activity, known as biofouling or biofouling build-up, can pose a threat to public health and is present in almost every water distribution system. Biofilm build-up occurs to a much greater degree in metal or concrete pipes.

In addition, vinyl pipes help to preserve a precious resource, water. Cast iron and ductile iron pipes are the most susceptible to corrosion and breakage. Weak spots caused by rusting can form in these materials and in some cases penetrate the pipe wall and cause leaks, resulting in water loss, pipe breakage and, potentially, water contamination. A single pipe leaking just 2.2 litres of water per minute equals more than 130,000 litres of lost water each year.

Vinyl medical products

Vinyl has been the material of choice in the health care industry for over 40 years—over 25 percent of all medical plastics and over 70 percent of all disposable medical applications are made of vinyl. This includes the bags containing life-giving blood, and the tubing and valves that transport it.

Intravenous containers, tubing, dialysis equipment, examination gloves, containing life-giving blood, and the tubing and valves that transport it.

Disposable medical applications are made of vinyl. This includes the bags

**1999 Global Demand for Chlorine/Caustic Soda**

<table>
<thead>
<tr>
<th>End Uses</th>
<th>% of Vinyl Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl</td>
<td>34%</td>
</tr>
<tr>
<td>Organics</td>
<td>21%</td>
</tr>
<tr>
<td>Chlorine</td>
<td>8%</td>
</tr>
<tr>
<td>Poly-olefins</td>
<td>6%</td>
</tr>
<tr>
<td>Water</td>
<td>6%</td>
</tr>
<tr>
<td>Other</td>
<td>27%</td>
</tr>
</tbody>
</table>

Vinyl, a major product

One of the major products of chlorine chemistry is polyvinyl chloride, known as PVC, or vinyl. Invented in the United States in the early 1920s, it was first used for insulated wire, raincoats and shower curtains. As vinyl's versatility and flame-resistant properties became more widely known, dozens of new, innovative uses were developed and manufacturing plants established.

Today, vinyl is the third largest selling plastic in the world.

Vinyl products—such as wire and cable, siding, windows and doors—are a staple of the construction industry because they are easy to maintain, long lasting, attractive and economical. In fact, vinyl is the material of choice for European window frames because of low maintenance. In North America, vinyl is the material of choice for siding, decking, railings and house trim because it neither rot nor requires painting. Vinyl piping transports water to thousands of homes and industries because it is resistant to corrosion, microbial growth and leakage.

The chlorine tree

But chlorine’s unique properties mean it can be used in numerous and varied ways. Its reactive nature allows it to bond with other chemical elements to form substances that make up, or lead to, products we use every day. It is called the single material on which production of other chemicals depends. It is involved in over 50 percent of all commercial chemistry, and its myriad uses are displayed on the “chlorine tree.” (Please see inside).

Yet, while chlorine is needed along the way to make chemical processes happen, many of the resultant products don’t contain chlorine, such as polyurethanes, polycarbonates and epoxy resins. Because these types of compounds are versatile, lightweight, easily adaptable, strong, durable and safe, they are used to make a broad range of products from electronics to packaging and automotive to construction.

Polystyrene, for example, is often used for seats, dashboards, sound insulation, door panels, and foam mattresses. In fact, about 80 percent of the population in Latin America sleep on inexpensive, flexible polystyrene foam. If not for this affordable alternative, a vast majority of the population would continue sleeping on uncomfortable cotton, hay or horsehair mattresses.

Perhaps one of the most critical uses of chlorine chemistry involves our health. Today, about 85 percent of all pharmaceuticals contain an end use manufactured using chlorine chemistry, including medicines that treat heart disease, cancer, AIDS and malaria.

Chlorine is also essential in helping to produce a wide range of medical equipment, from X-ray and mammography films to medical tubing and blood bags.

Vinyl siding by Certain Teed Corp.

www.worldchlorine.com

**Chlorine Chemistry's End Uses**
Products of the Chlorine Tree

Chlorine is one of the most abundant naturally occurring chemical elements. It also plays a prominent and significant role in the manufacture of thousands of products we depend on every day.

1. **Ethylcellulose**
   - Used in the production of adhesives and paints.
   - Commonly found in household products like wallpaper and fabric stiffeners.

2. **Chlorine**
   - Used in the production of various chemicals and compounds.
   - Commonly used in the bleaching of paper and processing of sewage.

3. **Vinyl Chloride**
   -主要用于生产聚氯乙烯（PVC）。
   -用于制造管道、电线和电缆绝缘材料、薄膜和胶带。

4. **Ethylene Oxide**
   - 用于生产消毒剂和杀菌剂。
   - 常用于制造清洁剂和洗涤剂。

5. **Acrylonitrile**
   - 用于生产尼龙和其他合成纤维。
   - 常用于制造汽车内饰和服装。

6. **Ethylene Dichloride**
   - 用于生产氯乙烯单体。
   - 常用于制造塑料薄膜和绝缘材料。

7. **Phosphorus Trichloride**
   - 用于生产聚合物和其他化合物。
   - 常用于制造电子硅胶和半导体材料。

8. **Silica**
   - 用于生产耐火材料和催化剂。
   - 常用于制造红外热反射膜。

9. **Phosphorus**
   - 用于生产磷酸盐和多元醇。
   - 常用于制造电子和化学制品。

10. **Hydrochloric Acid**
    - 用于生产多种化学物质，包括氯化物和酸。
    - 常用于制造食品添加剂和防腐剂。

11. **Sulfuric Acid**
    - 用于生产硫酸盐和多种化学物质。
    - 常用于制造清洁剂和洗涤剂。

12. **Bleach**
    - 用于生产漂白剂和染料。
    - 常用于制造洗涤剂和防腐剂。

13. **Ammonium Chloride**
    - 用于生产肥料和消毒剂。
    - 常用于制造电子和化学制品。

14. **Sodium Bicarbonate**
    - 用于生产饮料和食品添加剂。
    - 常用于制造食品和饮料。

15. **Calcium Chloride**
    - 用于生产消毒剂和防腐剂。
    - 常用于制造食品和饮料。

16. **Magnesium Chloride**
    - 用于生产化工原料。
    - 常用于制造化工原料。

17. **Potassium Chloride**
    - 用于生产肥料和制药原料。
    - 常用于制造肥料和制药原料。

18. **Ammonium Nitrate**
    - 用于生产肥料和工业原料。
    - 常用于制造肥料和工业原料。

19. **Calcium Sulfate**
    - 用于生产化学原料。
    - 常用于制造化学原料。

20. **Sodium Nitrate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

21. **Sodium Chlorate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

22. **Sodium Bromide**
    - 用于生产化工原料。
    - 常用于制造化工原料。

23. **Sodium Iodide**
    - 用于生产化工原料。
    - 常用于制造化工原料。

24. **Sodium Cyanide**
    - 用于生产化工原料。
    - 常用于制造化工原料。

25. **Sodium Silicate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

26. **Sodium Hydroxide**
    - 用于生产化工原料。
    - 常用于制造化工原料。

27. **Sodium Carbonate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

28. **Sodium Chloride**
    - 用于生产化工原料。
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29. **Sodium Phosphate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

30. **Sodium Sulfate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

31. **Sodium Formate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

32. **Sodium Perchlorate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

33. **Sodium Perbromate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

34. **Sodium Persulfate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

35. **Sodium Thiosulfate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

36. **Sodium Nitrite**
    - 用于生产化工原料。
    - 常用于制造化工原料。

37. **Sodium Nitrate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

38. **Sodium Peroxide**
    - 用于生产化工原料。
    - 常用于制造化工原料。

39. **Sodium Peroxyacetate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

40. **Sodium Peroxybromate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

41. **Sodium Peroxychlorate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

42. **Sodium Peroxyfluorosulfate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

43. **Sodium Peroxyiodate**
    - 用于生产化工原料。
    - 常用于制造化工原料。

44. **Sodium Peroxyphosphoacetate**
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