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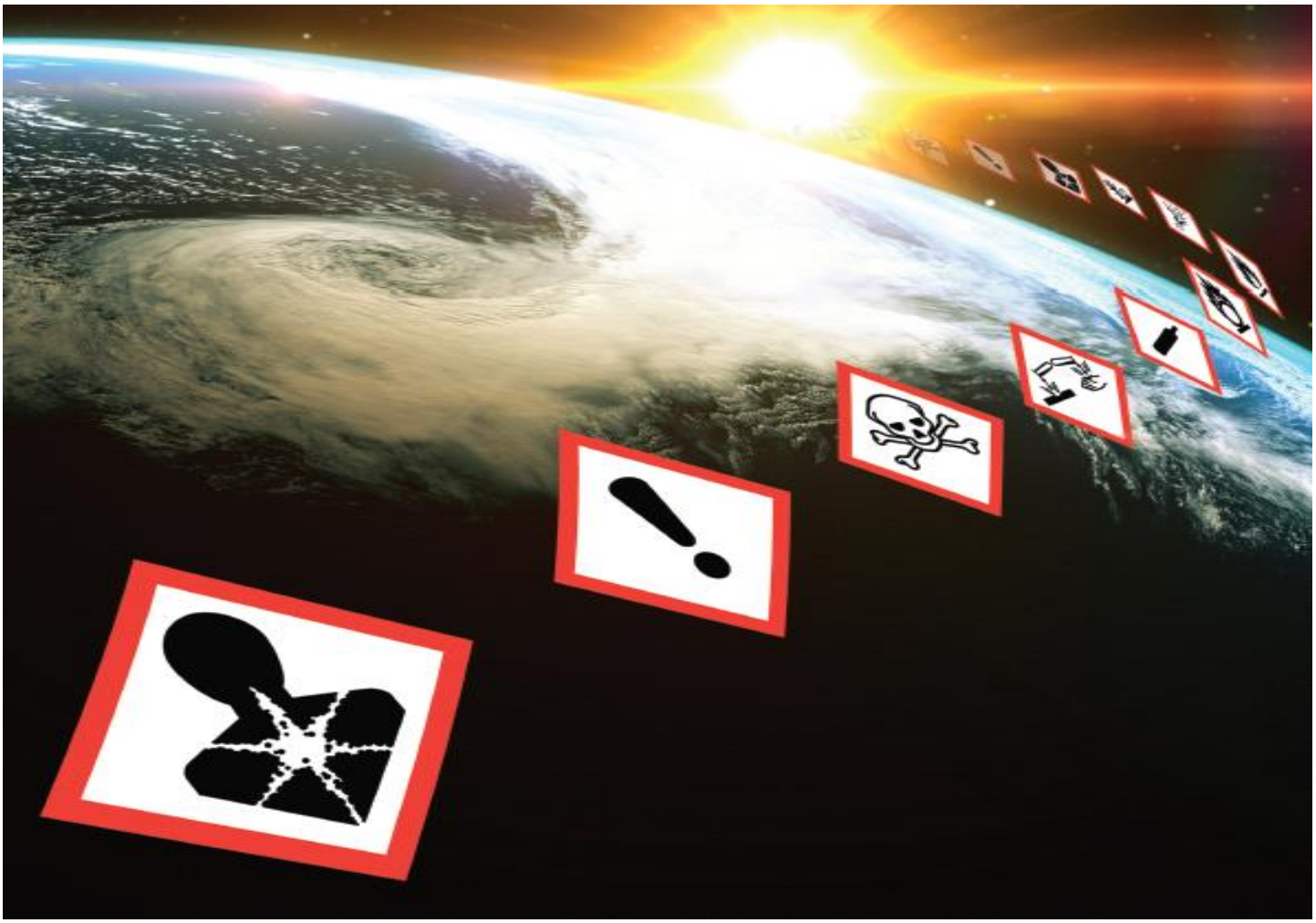
**WHITEPAPER**



# Globally Harmonized System

## Labeling Requirements

Benefits, Considerations, and Options for Compliance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## Overview

The Globally Harmonized System of classification and labeling of chemicals offers the world a uniform means of communicating information regarding hazardous materials. Language aside, the most critical information is easily visible via pictogram. With the intent of improving workplace safety and promoting environmental health, a series of updated labeling requirements and Material Safety Data Sheet (MSDS) updates will affect chemical manufacturers, distributors, and exporters around the world.

## Definitions and Requirements of GHS

Initially conceived in 1992, GHS is currently in the process of being implemented in the United States with a target compliance date of June 1, 2015. The US version of the standard is officially being referred to as the HCS OSHA-GHS (where HCS = Hazard Communication Standard). For the purposes of this white paper, we will simply refer to it as "GHS".

The updated HCS alignment to GHS results in four major changes that need attention, as outlined below. This white paper will focus primarily on the labeling requirements and options (item #2 below).

1. *Hazard Classification*: Will provide specific criteria for classification of health and physical hazards, as well as classification of mixtures

2. *Labels*: Chemical manufacturers and importers will be required to provide a label that includes six elements for compliance (we will discuss these in greater detail in the following pages):
    1. Product Identifier
    2. Signal Word
    3. Hazard Statement
    4. Pictograms
    5. Precautionary Statement
    6. Supplier Identification

3. *Safety Data Sheets*: Formerly referred to as Material Safety Data Sheets (MSDS), Safety Data Sheets will now have a specified 16-section format for more readily finding information

4. *Information & Training*: Employers were required to train workers by December 1, 2013 regarding the updated label elements and safety data sheet formats

## Advantages & Benefits of GHS Labeling

While a mandatory change to a current process can be an unwelcome task, however there are some tangible advantages and benefits that come with implementing a GHS-compliant program:

1. *Advantage:*
   Your organization is globally-responsible. The ease of importing and exporting chemical products will be heightened as GHS compliance virtually eliminates the need to meet country-specific documentation and testing standards, workplace safety standards, and environmental standards.
   *Benefits*:
   - Less documentation and paperwork = increased productivity
   - Virtually eliminate OSHA fines = cost savings
   - Consistent and compliant labeling approach = less returned product, reduction in shipping and freight costs

2. *Advantage:*
   The implementation of a consistent means of hazard material communication equates to a decreased risk of employee health and safety risks.
   *Benefits*:
   - Fewer claims = potential reduction in insurance and liability costs
   - Clearer and more accessible hazard communication = increased productivity
   - Socially and environmentally responsible organization = good public relations and potential decline in employee turnover

3. *Advantage*:
   With one clear and concise method of hazard communication, there is an increased potential for the streamlining of internal operations. GHS compliance can be the first step of auditing and improving overall business processes.

   *Benefit:*
   - Combining the exercise of GHS compliance with an overall audit to measure processes = potential for efficiency improvements, cost savings, space savings, increased throughput

## What Constitutes a Compliant Labeling Solution?

### Six Elements of a Compliant Label:

GHS compliant labels combine text and warning statements, along with easy-to-understand pictograms to communicate hazard and health warnings. As briefly discussed on page 3, there are six required elements for a GHS compliant label:

1. *Product Identifier/Ingredient Disclosure*: Chemical name, product name, ingredient name, or chemical mixture identifier
    - Technical names must be unified with and listed on the MSDS sheet
    - The goal of the product identifier is to prevent accidental or uneducated exposure. An employee, shipper, or supply chain partner should be readily able to identify the chemical and note it's potential hazard

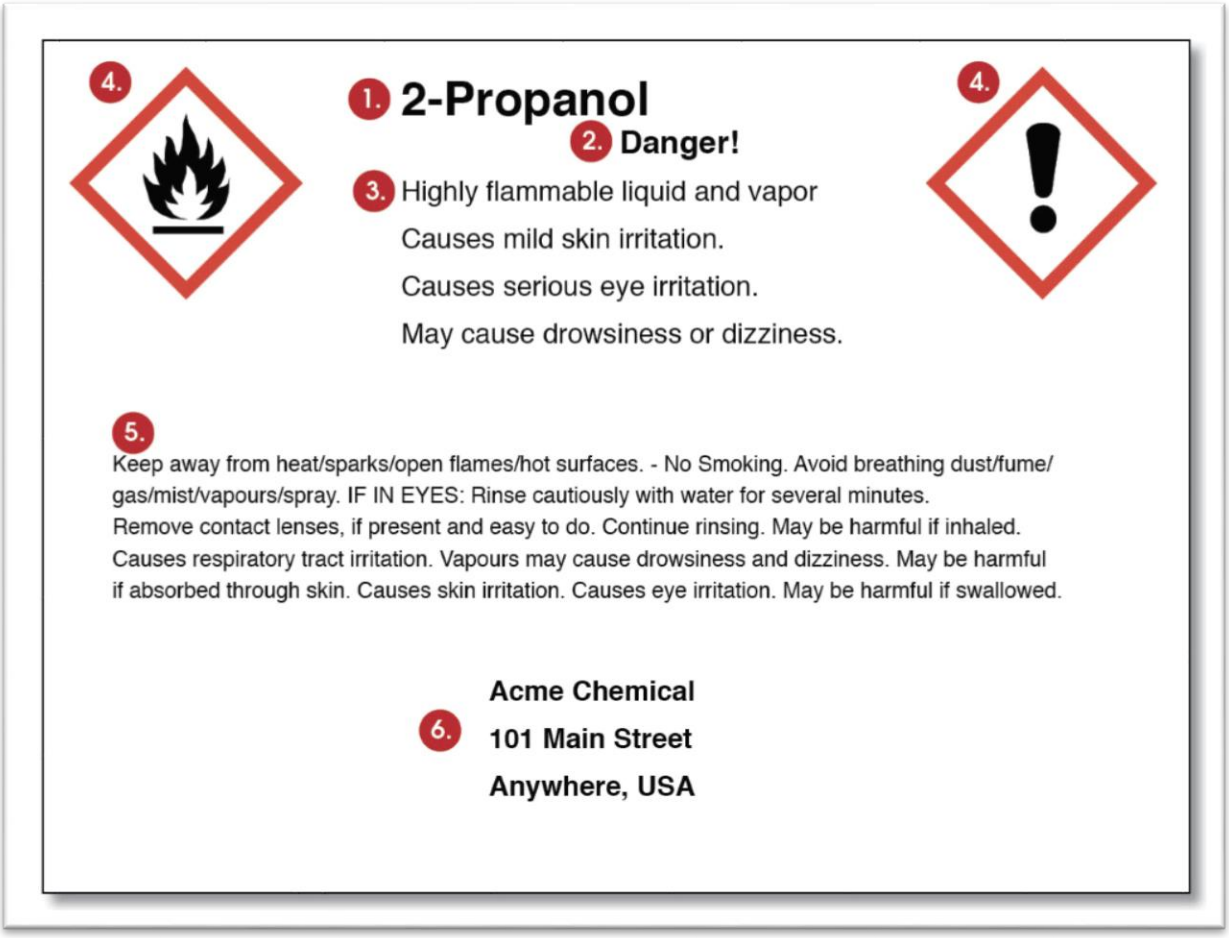
2. *Signal word:* The signal word indicates the severity of the hazard of the chemical
    - "Warning" (along with the numerical "1") indicates a less-severe/ non-lethal hazard
    - "Danger" (along with numerical "2") indicates a more-severe/potentially lethal hazard

3. *Hazard Statement*: Standardized phrases that describe the nature and degree of the hazard extended by the chemical.

4. *Pictogram (s):* A black symbol on a white background with a red diamond border which conveys information about the hazards and risks associated with the chemical. Used in conjunction with the signal word, the pictogram communicates the severity of the risk and is designed to prevent accidental or uneducated exposure. If applicable, more than one pictogram may be used per label (refer to the OSHA-approved pictograms on page 6 for more detail).

5. *Precautionary Statement (s):* Standardized phrases that describe recommended measures that should be taken to minimize or prevent adverse effects that result from exposure to the chemical, or from improper handling/storage**.** Precautionary statements must be used in relation to displayed pictograms, and should not exceed the maximum of six per label.

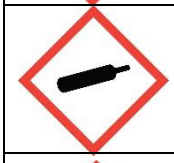
6. *Supplier Identification*: Each chemical container (including secondary packaging such as crates) should include the following supplier/manufacturer/importer contact information: name, address, and phone number.


4.
1. 2-Propanol
2. Danger!
3. Highly flammable liquid and vapor
Causes mild skin irritation.
Causes serious eye irritation.
May cause drowsiness or dizziness.
4.
5.
Keep away from heat/sparks/open flames/hot surfaces. - No Smoking. Avoid breathing dust/fume/ gas/mist/vapours/spray. IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing. May be harmful if inhaled.
Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness. May be harmful if absorbed through skin. Causes skin irritation. Causes eye irritation. May be harmful if swallowed.
6.
Acme Chemical
101 Main Street
Anywhere, USA


1. Product Identifier / Ingredient Disclosure
2. Signal Word
3. Hazard Statement
4. Pictograms
5. Precautionary Statement
6. Supplier Identification

## OSHA - Approved Pictograms

Pictograms must be combined with the corresponding elements of a GHS label discussed in the previous section. Critical information is communicated quickly and effectively via the OSHA-approved pictograms shown in the table below:

| Pictogram | Pictogram Name | Hazard Details/ Hazard Statements |
|---|---|---|
|  | Health Hazard | Germ Cell Mutagenicity; Carcinogenicity; Organ Damage; Birth Defects; Aspiration Hazard; Breathing Difficulties, Allergies, or Asthma if inhaled |
|  | Flame | Oxidizer, may intensify fire; Oxidizing gas; Flammable gas; Aerosol; Flammable Liquid; Flammable Solid; Heating may cause fire |
|  | Exclamation Mark | Harmful if swallowed; Toxic if inhaled; Harmful if in contact with skin; May cause an allergic skin reaction; May cause respiratory irritation |
|  | Gas Cylinder | Gas under pressure |
|  | Corrosion | Corrosive to metals; Causes serious eye damage |
|  | Exploding Bomb | Explosive; Heating may cause fire or explosion |
|  | Flame over Circle | In contact with water, releases flammable gas; Self-reactive substance/mixture; Self-heating; Catches fire spontaneously if exposed to air |
|  | Skull and Crossbones | Acute toxicity oral; Acute toxicity skin; Causes serious eye irritation |
|  | Environment* | Aquatic environmental toxicity acute; Aquatic environmental toxicity chronic |

*Not a mandatory pictogram according to OSHA

## Shipping Overseas: BS 5609

There is an internationally recognized standard that applies to labels used to identify items for marine shipment. British Standard BS 5609 requirements meet both GHS and International Maritime Dangerous Goods (MDG) standards and outline the essentials for label adhesive performance, print durability, and abrasion resistance. Three months immersion in sea water without fading, while maintaining adhesion to the container is the standard imposed; only a handful of label materials/adhesives/print technology combinations are able to meet the standard.

If any of your goods will be shipped via oceangoing vessel, or you see the BS 5609 standard specified, ensure that the label material you choose to utilize, or your vendor is using, has been properly tested to meet the standard.

## GHS Standard Label Sizes

While label size isn't regulated by OSHA in the United States, there are some countries that require a specific label size relative to the container capacity. Below is a reference chart for standard label sizes that suit hazard communication in both the United States and abroad.

| **Container Capacity** | | **GHS Label Dimensions** | |
|---|---|---|---|
| *Liters* | *Gallons* | *Inches* | *Millimeters* |
| ≤ 3 | ≤ .79 | 2 x 3 | 52 x 74 |
| 3 - 50 | 3.17 – 13.2 | 3 x 4 | 74 x 105 |
| 51 - 500 | 13.2 - 132 | 4 x 6 | 105 x 148 |
| ≥ 500 | ≥ 132 | 6 x 8 | 148 x 210 |

It is important to work with an experienced solutions supplier in instances when your goods will be shipped beyond the borders of the United States as they can assist in verifying correct label size required per the regulations of the final destination.

## MSDS (Material Safety Data Sheets) ➡ SDS (Safety Data Sheets)


Formerly referred to as Material Safety Data Sheets (MSDS), Safety Data Sheets (SDS) require all the information needed to print a GHS-compliant label for a specific chemical. In addition, to improve information-flow, Safety Data Sheets are now outlined in an easy-to-follow 16 section format. The format of the Safety Data Sheet is as follows:

| Section | Subject | Details Included in this Section |
|---|---|---|
| 1 | Substance and company identification | Product identifier, supplier identification, recommended use of the chemical |
| 2 | Hazard identification | Hazard classification, signal words, hazard statements, pictograms, precautionary statements, description of any hazards not otherwise classified |
| 3 | Composition/information on ingredients | Ingredients contained in the product, information on substances, mixtures, and chemicals |
| 4 | First-aid measures | Necessary first aid instructions, description of most important symptoms or effects |
| 5 | Firefighting measures | Recommendations of suitable extinguishing equipment, advice on specific hazards that develop from the chemical during a fire, recommendations on protective equipment |
| 6 | Accidental release measures | Recommendations on the appropriate response to leaks, spills, or releases, use of precautions, emergency procedures, methods/materials used for containment, cleanup procedures |
| 7 | Handling and storage | Precautions for safe handling, recommendations for safe storage conditions |
| 8 | Exposure controls/personal protection | Exposure limits, engineering controls, and protective measures to minimize exposure |
| 9 | Physical and chemical properties | Physical and chemical properties associated with the substance or mixture |
| 10 | Stability and reactivity | Reactivity hazards and chemical stability info |
| 11 | Toxicological information | Likely routes of exposure, numerical measures of toxicity, description of symptoms |
| 12* | Ecological information | Information to evaluate environmental impact |
| 13* | Disposal considerations | Guidance on proper disposal practices |
| 14* | Transport information | Guidance for shipping and transporting |
| 15* | Regulatory information | Other safety, health, or environmental regulations not indicated elsewhere on SDS |
| 16 | Other information | Date/edits made to last SDS revision |

*Non-mandatory according to OSHA

## Options to Consider for GHS Compliance

There are a variety of options to consider when deciding how you will meet GHS labeling requirements. It is important to determine which method will best meet your business needs while also allowing for process improvements. The following pages will outline in greater detail four options that will ensure GHS-compliant labeling:

1. Purchase partially-pre-printed labels with red diamonds for printing variable data on-demand with an existing label printer
2. Decision to invest in a two-color thermal transfer printer and media to print-on-demand
3. Decision to invest in a full-color inkjet printer and media to print-on-demand
4. Decision to invest in a full-color laser printer and media to print-on-demand
5. Purchase fully-pre-printed GHS-compliant labels

### *Purchase Pre-Printed Labels with Red Diamonds for Printing Variable Data On-Demand with an Existing Label Printer*

For instances when there is a low mix of label sizes and chemicals to be identified, the use of an existing one-color printer might be sufficient. Label stock would need to be ordered from the supplier with pre-printed red diamonds. Pictograms, signal words, hazard statements, supplier information, and other text would be printed on-site and on-demand. This solution, while cost effective without the investment of an additional printer, may be taxing on space and inventory as large quantities of label stock will need to be kept on the shelves. Additionally, logistical challenges can arise if there are multiple label sizes, each with different quantities of pre-printed diamonds that need to be properly managed and correctly utilized for different applications. Lastly, if shipping to a destination that requires specific label sizes per container capacity (reference page 8), it is important to ensure that the current label printer will accommodate the prescribed label width.

Below are the advantages, benefits, and limitations associated with the decision to utilize an existing printer with partially-pre-printed label stock:

| Features | Advantages | Benefits | Limitations |
|---|---|---|---|
| Partially pre-printed with GHS diamonds according to your specifications | Flexibility for on-demand printing without the investment of a color printer | Utilize existing print method for cost savings | Difficulties in inventory management. Frequent need to change-out label stock from printer |
| Options for other pre-printed color additions to the label (i.e. logo, product info) | Easily improve appearance of label & include other GHS requirements | Meet compliance standards with minimal impact to current process; operational efficiencies | Lack of flexibility |

### *Invest in a Two-Color Thermal Transfer Printer and Media to Print-on-Demand*

Organizations familiar with thermal transfer print technology might feel most comfortable using it for GHS-compliant labeling as well. A thermal transfer printer with two inline print units that offer simultaneous printing of two colors on one label can meet those needs. Because staff is already familiar with the technology, very little education or training is needed, and implementation time can be short. With the ability to print two colors at once at speeds of up to five inches per second, this print method also offers the potential for increased throughput.

One of the primary reasons thermal transfer printing is a preferred technology is because of the durability of the label stock and the quality of the images. To achieve these results however, it is critical that the label stock and ribbon be carefully matched; working with an experienced solutions supplier will ensure proper label/ribbon kitting to withstand the expected environment. Important when there is a need to print multiple label types and sizes, which also might require printed content changes, thermal transfer print-on-demand provides the flexibility to print labels up to 6” in width.

With a moderate price-point and ribbon-saving feature, the total cost of ownership for a thermal transfer printer solution can be a cost-effective, easily implemented solution for organizations with a need for color and the flexibility to print on-demand. With the option to upgrade to a printer-applicator, improved efficiencies and fast return on ROI can be realized for organizations that print high volumes. An added benefit is that a two-color printer can be utilized for other labeling applications that might require minimal color (logos, product info, etc.) All thermal transfer printer providers agree that print-heads should be considered a consumable, just like labels and ribbon. Print heads should be regularly cleaned and replaced; with the proper maintenance they can last up to 3 million lineal inches of printed stock.

Below are the advantages, benefits, and limitations associated with the decision to implement two-color thermal transfer technology to print-on-demand:

| Features | Advantages | Benefits | Limitations |
|---|---|---|---|
| Proven industrial print technology | Low risk investment, validated process, expert resources available | Reduced downtime, short learning curve, overall risk reduction | Higher cost of initial investment as compared to inkjet |
| Transfer of heat provides a durable image when used with Computype materials | End result survives chemical and water exposure; resistant to smudging | Confidence in a reliable solution, label will survive its purpose; reduce need for re-labeling projects | Time for preliminary testing and validation is required |
| Solution offers black + 1 additional color option (red for GHS) | Only need 2 ribbons = reduction in inventory costs & space allotment | Cost savings via Lean-friendly ordering process | Inability to multi-task technology for full color print projects |
| Efficient print speed & pristine image quality | Increased throughput & operational efficiencies | Reduction in label operation costs | Strict maintenance and upkeep is needed to maintain speed and quality |

### *Invest in a Full-Color Inkjet Printer and Media to Print-On-Demand*

If full color printing is desired, or if the labels you need to print exceed the size limitations of other printers, a full color inkjet printer is the solution for GHS-compliance. Offering not only maximum flexibility for print image, full color inkjet also provides ample opportunity to create internal process improvements to the existing labeling system. With the flexibility to print not only pictograms and variable text, but brand logos, graphics, photos, and product information in full color, these industrial inkjet printers can serve multiple purposes. Chemical companies that need to print product labels or warning panels in addition to GHS labels can now accomplish this with one print technology. A more sizable printing area (up to 8" x 22") allows for printing large chemical drum labels.

Overall, full-color inkjet printers require minimal startup costs and achieve a relatively low cost of total ownership. Ink cartridges are purchased individually (CMYK) and are easily loaded into the printer. Purchasing and replacing each color on an as-needed basis allows for cost and time savings while reducing overall waste. With high print speeds, inkjet printing allows for increased throughout and efficiency improvements. (Print speeds depend upon several factors such as label size and desired print quality; a better estimate of throughput speeds can be determined after an initial analysis.)

When considering inkjet as an option for GHS-compliant printing, it is important to also account for the combination of label material and ink. Just as not every ribbon works with every label when using a thermal transfer printer, not every label material receives ink in the same fashion when it comes to inkjet printing. There are a variety of paper, polyester, and polypropylene materials that will provide a durable and lasting inkjet image; as always, make sure your solutions supplier is well educated in matching label material with media.

Below are the advantages, benefits, and limitations associated with the decision to implement a full-color inkjet technology to print-on-demand:

| Features | Advantages | Benefits | Limitations |
|---|---|---|---|
| Low cost of ownership (initial investment & maintenance) | Economical solution for GHS compliance | Overall cost savings, budget dollars spent wisely, easily justified investment | Lesser overall print quality than competing technologies |
| Solution provides full color printing (CMYK) | Flexibility to print in full color (logos, product info, etc.) | Potential for multi-tasking budget dollars (compliance & marketing) | Longer learning curve & implementation time if inkjet is a newly adopted technology |
| Individual ink cartridges | Order & replace colors as needed, based on print demand | Reduce space & costs dedicated to print supplies & inventory | Increase inventory management time & purchasing patterns |
| Provides a durable image when used with Computype label materials | End result survives chemical and water exposure; resistant to smudging; BS5609 - compliant materials | Confidence in a reliable solution, label will survive its purpose; reduce need for re-labeling projects | Time for preliminary testing and validation is required |

### *Invest in a Full-Color Laser Printer and Media to Print-On-Demand*

In cases where budget dollars are not a restraint and full color and prime print quality output are sought after, laser print technology is a consideration. Above and beyond what is required for GHS-compliance, a laser printing solution offers the benefit of true multi-tasking technology. Aesthetically more pleasing than other print technologies, but often more costly than its inkjet rival, laser technology provides the best in image quality and widest print width availability.

One of the major drawbacks to this option are the investment costs. Initial capital investment is often times exponentially higher than other technologies on the market, while consumables and service costs also tend to be greater. Coupled with the potential that this kind of print quality can often be unnecessary, laser print technology doesn't accommodate all budgets or compliance goals.

Below are the advantages, benefits, and limitations associated with the design to purchase implement a full color laser printing technology to print-on-demand:

| Features | Advantages | Benefits | Limitations |
|---|---|---|---|
| Solution provides full color printing and pristine image quality | Flexibility to print in full color (logos, product info etc.) | Multi-tasking budget dollars when color capabilities are used for other labeling projects | Pristine image quality merits high investment and consumable costs |
| Availability to print a wide range of label sizes | Flexibility to utilize print technology for multiple-sized printing projects | Multi-tasking budget dollars when printing range is fully utilized | Different projects and varied print use can lead to increased service costs |

### *Purchase Fully Pre-Printed, GHS-Compliant Labels*

Only relevant for applications that do not require flexibility for real-time data to be printed on-demand, another option to meet GHS-compliance would be to purchase fully pre-printed labels from your solutions supplier. The benefit is that no process changes will occur internally as a result of GHS, and compliance will be met with minimal impact. The drawback is that this option is limited to a select few organizations, and can pose inventory and space issues when pre-printed label stock must be kept on-hand and used accordingly.

Below are the advantages, benefits, and limitations associated with the decision to purchase fully pre-printed GHS compliant labels from a solutions supplier:

| Features | Advantages | Benefits | Limitations |
|---|---|---|---|
| Labels designed & printed according to your specifications | No need for hardware investment | Cost savings | Potential for difficulties in inventory management |
| Ready to use immediately upon delivery | Save steps when print-on-demand is eliminated | Increased throughput, time savings | Lack of flexibility |

## Conclusions

Simply put, the GHS-regulation can be viewed as an update to the existing method of classifying chemicals. With an enforcement date set of June 1, 2015, organizations will need to update both the labeling protocol and the associated documentation with the end goal of improving employee health and safety. There are several compliance options that should be considered before making the decision to implement: partially pre-printed labels for use with an existing printer, the investment in a two color thermal transfer printer, the investment in a full-color inkjet printer, or (if applicable) the decision to purchase fully pre-printed GHS-compliant material from your solutions supplier.

GHS-regulations offer the opportunity to improve upon existing business process and workflows. In working with the optimal solutions supplier, not only will the project end in compliance, but perhaps in increased throughput, reduced costs, and a long-term plan for best practices in overall classification and identification.

## About Computype

Based out of St. Paul MN, Computype is a global leader of harsh environment tracking and labeling solutions. Serving the Industrial, Healthcare, and Tire markets for over 40 years, Computype helps customers to realize cost savings, increased throughput, and teaches efficient labeling management practices.