



Become a Better Writer

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MARKETING TO ENGINEERS

You may call yourself an engineer, but you're
also a writer. Follow these 10 tips
to improve your writing.

When it comes to accelerating your career success, increasing your chances of getting a job or promotion, and even making more money, technical writing skills are highly valuable. Conversely, weak communications skills can hinder your career progression and even make it difficult for you to get hired. For example, some business units at Rockwell Automation, a Milwaukee-based automation vendor, specifically evaluate candidates' writing ability, reports Susan Schmitt, a senior vice president of human resources (1).

In a survey conducted by the College Board, a nonprofit organization, about half of the companies surveyed said they consider writing ability when promoting employees, and nearly all said they would hold poorly written job application materials against candidates (2). A recent survey by the National Association of Colleges and Employers (NACE) found that the ability to create or edit written reports was one of the top 10 skills employers look for when hiring new college graduates (3). According to an article published by the Institute of Electrical and Electronics Engineers (IEEE),

engineers spend 20–40% of their workday writing, and the higher they move up the corporate ladder, the more writing they do (4).

Engineers are often tapped to write, help write, or work with editors and technical writers to produce reference, product, marketing, and educational materials, including technical articles, press releases, instructions, datasheets, reports, manuals, proposals, emails, newsletters, blog posts, web page content, white papers, books, and presentations.

It is important for engineers to write and edit publications skillfully, quickly, and correctly. Clear, concise, and persuasive prose could prevent a safety incident, make a project proceed more efficiently, convince others of the merits of your ideas, reduce calls to customer support, and improve user satisfaction. In addition, good writing can help establish your reputation as an expert in your field, gain wider acceptance of your company's technology, get your work published, and even generate more leads, inquiries, and sales of your products and services.

“Publish or perish” doesn't just apply to scholars, writ-

ing can help your star rise higher and faster within your organization and in your field. “The reverence people have for the printed word is amazing. Simply because a man [or woman] appears in print, the public assumes that he [or she] has something authoritative to say. This applies on every level,” writes Edward Uhlan in his book *The Rogue Of Publishers’ Row: Confessions Of A Publisher* (5).

The proliferation of personal computers and increasing use of email — which enables us to write more and more often — makes writing an undeniably important skill. When I entered the corporate world as a technical writer in the late 1970s, the only people using typewriters were secretaries. All the technical writers in my department wrote in longhand with a pen and pad, and gave their work to a secretary to be typed up. When I told my boss I needed a typewriter, he thought I was nuts and discouraged me. But I insisted and found a clunky old electric typewriter in storage.

Back then, the average manager or executive did not have a typewriter, so they wrote very little. But now, thanks to computers and email, everyone is a writer. The average engineer spends about one-third of their time writing. If you spend a full third of your day doing something, wouldn’t you want to do it well?

What does it take to get your writing skills to the next



GETTING STARTED

You wouldn’t undertake an engineering or design project without developing a plan, so don’t start writing without a set plan either. No matter the extent of the document, make sure you always:

- identify your audience and their expectations
- know the purpose of the document; refer back to this often while writing so you don’t get off track
- understand the material you will present
- do your research, whether that’s reading the latest articles on your topic in scientific journals, talking to leading scientists in a particular field, or performing experiments
- think about potential visual aids that could help deliver your message
- organize your thoughts and materials
- choose a relevant organizational structure
- budget time to write, review, and edit.

If the document will be long, such as a report on a new equipment installation, consider creating a structured outline as part of your plan.

level? Surprisingly, less effort than you may think. In fact, you can significantly improve your writing with minimal time and effort just by putting into practice the 10 tips presented in this article.

#1. Be technically accurate

A U.S. Occupational Safety and Health Administration (OSHA) bulletin explains that the atmosphere we breathe must have 19.5% oxygen content or higher to sustain human life. If OSHA had made a typographical error and typed 9.6% instead of 19.5%, an engineer referring to this document while designing an automated fire suppression system might calibrate the nozzle to dispense an excessive volume of the fire-extinguishing agent. The excess volume of agent could lower the oxygen level in the room far below 19.5%. Although the fire will likely be extinguished, the inhabitants of the closed space may suffocate.

Compare this error to, for example, a Sunday newspaper mistakenly citing the distance between the Sun and Earth as 920 million miles instead of 92 million miles. Embarrassing? Yes. But no one is going to burn to a crisp flying their rocket too close to the sun, even if our rockets could fly that far, because scientists and engineers fortunately do not plan space flights based on popular science articles.

Accuracy in technical writing is more important than in perhaps any other type of writing, because people act on the information. If the content is inaccurate, everything from a product defect or structural weakness in a bridge, to a toxic chemical spill or an explosion, could result.

#2. Write clearly and conversationally

Readers — even those who are highly technical — appreciate documents that are clear and concise. In my nearly four decades as a technical writer, I have never once heard an engineer complain that a document was too easy to read. Use these methods to make your writing a pleasure to read:

• *Omit needless words.* Say what you have to say, but do so in the fewest possible words. Avoid redundant and wordy phrases. For instance, “plan in advance” is redundant, because all planning is done in advance. Simply write “plan.” The expression “RAM memory” is also redundant, because the M in RAM stands for memory.

• *Choose an informal, conversational style.* For instance, instead of “The data provided by direct examination of samples under the lens of the microscope are insufficient for the purpose of making proper identification of the components of the substance,” write “We can’t tell what it is made of by looking at it under a microscope.” The second sentence is written in a more informal, conversational style than the first; it flows more smoothly, is easier to understand, and sounds more natural than the first sentence.

- *Use the active voice.* The active voice expresses an action directly, as opposed to the passive voice, which expresses an action indirectly. Instead of writing, “Control of the bearing-oil supply is provided by the shutoff valves,” write “Shutoff valves control the bearing-oil supply.” The sentence that employs the active voice directly attributes the verb to the noun performing the action, which makes the sentence more clear.

- *Select an easy-to-follow organizational scheme.* The way you organize the information in your writing should logically fit your content. Organizing your material in chronological order or by stating the problem first followed by the solution is often best for a case study. Alphabetical order makes sense for a booklet on vitamins (*e.g.*, vitamin A, B1, B12, C, and so on) or an employee directory. Use sequential order for work instructions and process descriptions to make each step easy to follow and reference.

#3. Put the reader first

The difference between mediocre writers and good writers is that mediocre writers start with the subject, while good or excellent writers start with the reader. We often begin writing by thinking about what interests us first — which, for engineers, is often the process, machine, experiment, or technology — rather than our readers. But all professional writers, as well as all engineers and scientists who are good writers, put the reader first.

The more you tell your readers about what they want or need to know about your topic — how it relates to their problems, concerns, goals, project, job, or company — the more interested they will be. To do that, you must understand three things about your readers: who they are, how much they already know about your topic, and how they would benefit from knowing more about it.

Let’s say you are writing an article about when, where, why, and how to use motionless mixers for laminar flow applications in chemical plants. You of course know what motionless mixers are, how they work, their applications, and the advantages of using them, so your natural tendency is to assume everyone else does too. But they don’t. Many chemical engineers graduate without having seen a static mixer in operation. Even ChEs who have worked in industry may not have seen a static mixer in operation. Your article should educate both the experienced and inexperienced reader.

Answer these questions about your reader before you sit down to write an article, report, or paper on a specialized or technical subject:

- Are my readers chemical engineers, engineers or scientists in other fields, technical managers, nontechnical senior executives, or even laypeople?
- What do they already know about my topic?

The difference between mediocre writers and good writers is that mediocre writers start with the subject, while good writers start with the reader.

- What do they want and need to know about my subject?
- How important is my topic to them and their work?
- How will they use the information in my article in their work?
- What do I want them to believe, think, or do after reading my article?
- How can the methods I describe make or save money, increase yield, improve product quality, or deliver other desirable results?

#4. Write in the second person

Writing in the second person means addressing the reader as “you.” Doing so directly addresses the reader, thereby putting them first (as suggested in tip #3).

Using “you” engages the reader in a way that using the third person (*i.e.*, he, she, it, etc.) does not. Instead of writing in the third person, “Chlorine flow may be easily regulated by the operator through use of the control panel,” write in the second person, “You can easily regulate chlorine flow using the control panel.” The second sentence is more engaging, because it speaks to the reader directly.

Successful advertising writers — those who write primarily to persuade — will tell you that “you” is one of the two most persuasive words in the English language. People care about themselves first, and your products, technology, application, or project second. Therefore, when you write “you,” you are talking about the subject that matters most to them and it gets their attention.

(As an aside, the other most-persuasive word is “free.” If you put up a landing page on your company website for downloading your latest white paper, make the headline “Free White Paper on Managing Large Data Centers” instead of “White Paper on Managing Large Data Centers.” Adding “free” to the headline has been proven in numerous tests, in which response rates are precisely measured, to increase conversion rates.)

#5. Motivate the reader with benefits

Motivate the reader? Use benefits? That’s for advertising executives on Madison Avenue trying to sell soap, right? Don’t engineers simply inform and instruct, not persuade?

Quite the opposite is true. People are busy, and sometimes you need to sell them on an idea you want them to believe, an action you want them to take, or even a document you want them to read. Consider these introductory paragraphs of a manual on how to use a particular type of

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workstation as an exercise in persuasive technical writing:

The operator's workstation acts as the interface between the operator and the processes being monitored and controlled. It is often referred to as the human interface to the process. The workstation consists of devices that allow the operator to perform his or her duties in an efficient manner.

Utilizing all available documentation, the student will be able to use each of the devices provided with the operator's workstation to access displays, overlays, and environments; determine if display objects are pickable; and perform various windowing operations.

There is nothing particularly wrong with this text, but it could be improved. For starters, it is boring.

Many users do not bother to read manuals and this gets them into trouble from which technical support must then rescue them. By adding a benefit, you can motivate users to read the manual and operate the system properly, which can help reduce operator error and call volume at your help desk.

Here is the same text rewritten to make it clear to the reader the benefit of reading the document:

Your job is to monitor and control processes in your plant. The operator's workstation can help you do that job better and faster.

In this module, we'll explore all of the parts of your workstation, including the monitor, touch screen, keyboard, annunciator, keypad, mouse, trackball, and printer. In addition, you'll learn how to:

- *access displays, overlays, and environments*
- *determine whether a display object can be selected*
- *perform windowing operations.*

#6. Do one (or two) more drafts than you normally would

In writing, as well as many other activities, the law of diminishing returns applies. The more time you put into the work, the smaller the incremental improvement of the results for each additional hour of labor. The biggest gains occur in the beginning of the work, but as you continue, the return on your effort gradually shrinks (Figure 1).

Many of us work on our writing assignment until we get to Point A in Figure 1. Then, because we are busy, or prefer to move on to other things, we stop and hand in what is essentially our first draft. This is the kind of unpolished copy that makes you as the author cringe when you revisit and reread it. These types of rough drafts leave many readers scratching their heads and wondering, "What is the author trying to say?"

Mediocre writers stop at Point A, but they could make their writing better, stronger, and clearer by putting in a

little more time and effort. How much better can the document get, and how much time will be required?

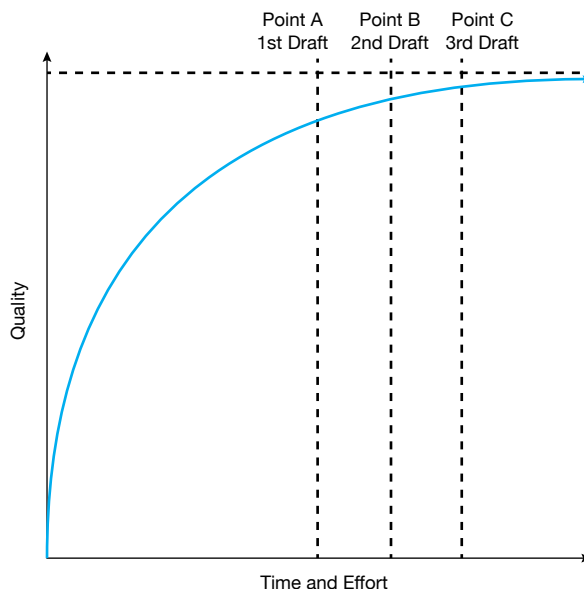
For the average engineer working in industry, I suggest you push forward to Point B even though you might feel like stopping at Point A. To move from Point A to Point B, you need to do one more draft, which usually includes careful editing and rewriting problematic sections. At this somewhat-early stage of the curve, the extra time you put in yields a quality improvement substantial enough to justify the added effort.

If you're an engineer who writes, you can stop at Point B. Many of the engineers in your organization that you consider decent writers, but who are not professional technical writers, probably write at the Point-B level. If, however, you are a professional technical writer or editor, or the document you are working on is of critical importance, you should do yet one more rewrite or edit, which will get you to Point C.

I would advise you to stop at Point C. Rewriting anymore will provide too little incremental improvement and too little return for the extra time invested. It simply doesn't pay off.

#7. Be consistent

Use consistent and correct grammar, spelling, nomenclature, symbols, units of measure, style, etc. The reason is simple: If you are inconsistent, you are automatically wrong at least part of the time. For example, do not use "USA" and "U.S.A." in the same document.



▲ **Figure 1.** When you develop your first draft into a second draft, the added effort pays off with vast improvements that make your document easier to read and more useful. As you develop the document further, the incremental improvements will gradually taper off.

Table 1. Check for these common errors to ensure your writing is clear.

	Incorrect	Correct	Why
Subject and Verb Disagreement	In reference to your recent letter, your address on our files are correct. An order form, as well as a post-paid envelope, are enclosed.	In reference to your recent letter, your address on our files is correct. An order form, as well as a post-paid envelope, is enclosed.	The subject of the sentence is “address,” not “files.” The subject is “order form,” which is singular and so the verb should also be singular.
Problematic Pronouns	John, George, and me met to discuss the job. We met with Mr. Brown, Mr. Smith, and yourself in New York.	John, George, and I met to discuss the job. We met with Mr. Brown, Mr. Smith, and you in New York.	Read the sentence with each subject one at a time, you will discover that “me” should be replaced with “I,” and that “yourself” should be replaced with “you.”
Dangling Modifiers	After finding the missing report, the search was ended by the administrative assistant.	After finding the missing report, the administrative assistant ended the search.	The modifier, “after finding the missing report,” modifies the assistant and not the search.
Displaced Modifiers	The payroll teller recommended First Carrier over Federated, whose delivery service is very prompt.	The payroll teller recommended First Carrier, whose delivery service is very prompt, over Federated.	If First Carrier is recommended, it must be the prompt company, not Federated.
Run-On Sentences	Your projected cost for fiscal 2017 is \$650,000, however, this figure may vary because of a variety of factors.	Your projected cost for fiscal 2017 is \$650,000. This figure may vary because of a variety of factors.	The “however” is the start of a whole new thought with its own subject and verb.
Unparallel Structure	Operators should carry out maintenance activities safely, carefully, and in a detailed manner.	Operators should carry out maintenance activities safely, carefully, and thoroughly.	Use the same pattern of words to show that ideas have the same level of importance.

Be consistent in your use of styles, such as boldface, italics, underlining, indenting, highlighting, type size, and font. For instance, if in chapter one of a technical book, the chapter title is in 14-point boldface flush left, the subheads are 12-point boldface flush left and underlined, and the sub-subheads are in 12-point italics centered, this schemata should be used consistently in every chapter.

Some readers hold even minor inconsistencies and errors, such as typos, against you. It distracts them to the point that all they want to do is point out the mistake to you rather than concentrate on the valuable content your document provides. Even a flub as seemingly inconsequential as “Farenhite” instead of “Fahrenheit” can give the impression that you are careless, needlessly distract the reader from your content, and raise doubts about the accuracy or validity of your entire document — unfair as that may seem. You do not want your efforts to be wasted and your technical prowess overlooked, so be mindful of details and be consistent.

Table 1 lists some of the most common grammatical errors businesspeople and engineers make and how to correct each.

#8. Keep it short

The quickest and most effective way to make your document less intimidating is to keep it short. Not the document itself; it should be as long as is necessary to include all pertinent information. Rather, keep the components of the document short.

Use small words. Mark Twain famously said, “I never write metropolis when I get the same nickel a word for writing city.” Similarly, do not write “utilize” when “use” means the same thing but is shorter and less pompous.

Keep sentences short. Use the “breath test.” Read the sentence aloud at an even speaking pace. If you run out of breath before you get to the end, it is too long. To fix long sentences, find a place where a new idea begins, and divide the one long sentence into two shorter sentences at that point.

Break up paragraphs. Long paragraphs are visually intimidating, tiring to read, and can be confusing. Break long paragraphs when you begin a new idea.

Organize information into short sections and subsections. Make your writing easier to scan and digest by using headers, subheads, numbered lists, and bullets. If you must include material that seems to interrupt the flow of the document, such as a long form or checklist, put it in an appendix. In a book of 200 pages, readers prefer 20 chapters that are 10 pages each over 5 chapters of 40 pages each.

Bullets and numbers help make lists more readable. If the order in which you present the points does not matter, use bullets. When information is sequential, such as in an article on the seven steps to specifying the right motionless mixer for your process, present the points in order and number each point.

When using a numbered list to structure an article, consider putting the number in the title or deck of your

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document to pique the reader's interest and grab their attention. Readers will be compelled to read your document to find out, for example, the seven steps necessary to specify a motionless mixer.

Although bulleted and numbered lists are easy to write and easy to read, do not overuse them. Documents that are page after page of bullets and numbers become monotonous, and many readers will simply not read the lists.

#9. Use gender-neutral language

Decades ago, engineering was a male-dominated profession, and in the 1980s, only 5.8% of engineers in the U.S. were women. However, this is no longer the case — today, about 18–20% of engineering students are female (6).

Because of this change in demographics, as well as the need to foster an inclusive work environment, engineers must avoid the use of sexist and gendered language. Using gendered words and phrases is a sure way to make yourself appear dated and risk alienating your reader.

Do not use words with the suffix “man,” such as policeman, weatherman, mailman, etc. Instead, use police officer, meteorologist, letter carrier, etc. This will make your writing more inclusive, as well as more accurate because these positions are held by both women and men.

When a sentence structure seems to force you to use gender-specific language, an easy solution is to rewrite the sentence to make the subject plural. Instead of “The customer pays no interest on his account balance,” rewrite this as “Customers pay no interest on their account balances.”

You may also use “he or she” and “him or her,” instead of indicating an individual gender in cases where you cannot simply make the subject plural. *CEP* follows the Associated Press (AP) style guidelines (with some modifications), and accepts the use of the singular “they” as a gender-neutral singular pronoun instead of using “he or she” and “him or her.”

#10. Use visuals and captions thoughtfully

Many engineers and technical writers use graphics from source documents to add visual interest to a white paper or technical article. If you do this, you must understand the contents of the graph, chart, or diagram well enough to write a meaningful and clear caption to accompany it. If you do not understand what the graphic is showing well enough to do that, either ask someone who does know or do not use it.

Always include meaningful captions that are full sen-

tences. According to industrial writer John Cole, captions get twice the readership as the main text. Capture important points in visuals with captions to help get your message across (7).

A good caption communicates more information than the image alone. If you show a photo of a horse, for example, including “horse” under the image is a label, not a caption. Offer an interesting piece of information instead, such as “The average horse weighs over 1,000 lb.”

Be aware that much of the content on the Internet, text as well as graphics, is copyright-protected. You cannot simply lift a graphic from the web and drop it into your document. You need to get the publisher's or author's permission in writing.

While text and artwork can be copyrighted, copyright law does not typically protect data and information. You can use data that you find online and draw your own graphs, bar charts, or pie charts. As a courtesy, list the source of the data in a footnote or endnote.

I am not an attorney, however, so the safest bet is either to get written permission to use someone else's material, and if you can't, then do not reprint it at all.

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