

CHEMICAL PROCESSING

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Take Your Career to New Heights

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Sharpen Your Speaking Skills

Oral presentations say a lot about you

By Dirk Willard, Contributing Editor



I was embarrassed for him. Technically, he was an excellent candidate. He was completing an internship at a prestigious company; his résumé was impressive for a new graduate. Now, the downside: his body language spoke of intimidation. He hardly looked up from his notes. When I tested his analytical skills with a problem, his answer was spot on but he was talking to the table twelve inches in front of his face.

Success in engineering, as in business, depends on communication. Writing skills will be covered in the next column (“Take the Write Steps for Career Advancement,” <http://bit.ly/2Eo42NI>), so here we will talk about verbal skills.

I was fortunate that I spent some of my formative years in the military. My presentation

skills were polished there, enabling me later to successfully handle a grilling by the head of chemical engineering at Princeton while delivering a paper to more than a hundred scientists. Outside of the military, organizations such as Toastmasters International can help bolster skills.

All presentations consist of two components: substance and appearance. You not only must anchor your argument in logic, but also should make your talk clear, concise, well organized and believable.

Let’s consider appearance first. Poor eye contact makes you look shifty and scared. Stooping or slouching and down-turned eyes make matters worse. Remember body language contributes a lot to communication — from 55–80%, experts reckon. In



Anticipate questions your audience might ask and prepare answers.

face-to-face communication, look directly at the audience, smile and avoid unnecessary repetitive movement.

Smiling can soften your audience. It's a good idea to think of something pleasant, practice smiling in the mirror and ask those close to you about which friendly expression looks best on you. There's more to body language than facial expression. Don't cross your arms or legs or put your hands in your pockets. Don't lean forward or backward — sit erect in your chair with your shoulders straight.

When delivering a speech, move your eyes around the audience. Ideally, focus on a different group of people every few seconds. Watch for crossed arms and legs. That often indicates a person has an opinion; so, ask questions to ferret these out. Occasionally try pacing to keep your blood flowing, if that works for you.

The cliché “dress for success” applies here. Wear something that is comfortable, gives a professional look and, just as important,

makes you feel competent. Look like you came to say something important. I've seen engineers give talks in torn tees and sweat pants and wondered why our client would take us seriously. Don't go too far the other way, though. Wearing a suit and tie in our business will make you the focus of ridicule. My operators at Anheuser-Busch loved to open valves on “suits” from the safety of the control room.

Now, let's talk about substance. Suppose you're trying to assure the client that you've considered the worst case of twenty drain pots that could potentially overwhelm the main header and vent in an alkylation unit collection tank. First, there are 190 potential pairs of pots as well as numerous triples, quadruples, etc. You've got to show the futility of running hundreds of simulations. Next, you must evaluate the potential for running multiple streams into the network. You must present the maximum potential flows and then show how several pairs could interact in the pipe network. These are logical steps that draw conclusions you can defend in your report. However,

don't get into all the details in the presentation: capture the key points and link them together with good graphics and a short punch list.

In a face-to-face discussion your tools are limited. Stick to no more than three points, without preamble, just the facts.

Lastly, consider the delivery: make it clear, concise and well supported. Know the material well enough that you can put your notes aside. For a face-to-face meeting you should be able to speak your piece in less than 30 seconds. A major presentation may last 30 minutes and take weeks to prepare

properly. (On projects get into the habit of summarizing all your work in a single notebook with updated abstracts — you can expand this into a presentation as needed.) You'll want to anticipate questions your audience might ask and plan how to steer them through the path you choose. This sounds Machiavellian but you don't want your good will with the audience to dissipate while you search for an answer. Create folders for questions with defense material inside. Don't forget to go over graphs and tables for hidden flaws.

Developing good presentation skills will go a long way to advancing your career. ●

Take the Write Steps for Your Career

The ability to compose clear and effective documents is an important asset

By Dirk Willard, Contributing Editor



The process description read like it was translated from Korean into Czech and then into English. My boss was no Shakespeare but I assumed he could write English. I asked him politely if I could “borrow” the text for 20 minutes. He then looked over my suggested revisions and, feeling a little embarrassed, handed the draft to me to finish.

Being able to write can be a great career asset. Not developing your writing skills likely will hold you back. Writing can help you in other ways, too. For instance, one of the best methods I’ve found to understand something is to write about it. The required disassembling and reassembling of information act as a great learning tool.

Here’s what you need to know to write more effectively.

One of the first lessons, according to my Air Force cadet textbook, “The Tongue and Quill,” is to know your audience. A corollary is to know why you’re writing and how the text generally should flow. Most companies have templates you can use for such things as design reports, studies and procedures.

With your goals clearly defined, develop a punch list of what the text must include. Let your ideas flow freely. Once you feel you’ve covered everything, ask someone to review the list — this may generate other suggestions. Then organize the ideas by arranging them in a spreadsheet under topics.

Cover one idea per sentence; group all ideas in the topic in a paragraph. This should give you a sense of length, assuming an average sentence of 15 to 20 words. If



As Shakespeare said:
“Brevity is the soul of wit.”

you have a length issue, start prioritizing. It will put your thoughts in focus and identify which ideas to eliminate.

At this point, you should have your summary or executive summary staring you in the face — so, write it. Draft it over and over again until it’s three paragraphs or less, perhaps half a page as a maximum. Pluck ideas off the spreadsheet to fill the sentences but don’t give away too much. Writing is a little like fan dancing. If you reveal too much too soon, you’ll spoil the show. Besides, you can’t substantiate all your points in a summary. You want people to read your report, cover-to-cover.

Support your write-up with graphics. Engineers tend to get more from illustrations than text. So, underpin your conclusions with figures and tables. Figures are preferable because they’re more concise. The title of a figure should succinctly summarize what you want to get across to the reader. The caption underneath should state what the figure shows.

Remember what Shakespeare said: “Brevity is the soul of wit” (Polonius in “Hamlet”). Keep titles and captions short, deliver them with punch! This thought applies to text as well.

Pay attention to sentence structure. Break up sentences to avoid running ideas together. Split related ideas into individual sentences whenever possible. Separate connecting ideas with semi-colons. Use colons to end a thought by punctuating it with a single phrase. Colons are for phrases; semi-colons are for connecting sentences. Do you see how that works? The dash (—) also is useful — but like all devices, including the overworked comma, use it sparingly or your employer may want a urine test.

Review your summary several times and then, armed with supporting figures and tables, tackle the body of the report. This is where you fall back on templates. There are a number of good ones for engineering reports, proposals and procedures but it’s best to follow the format used at your company.

When you don't have a template available use the following structure for technical reports: 1) executive summary; 2) introduction; 3) discussion; 4) conclusion; 5) and the appendix. (This format may not suit other writing assignments, though.)

If text in a report exceeds five pages, you'll probably need a table of contents. I usually write the summary next, with the executive summary fresh in my mind, so I can elaborate on key points. Then I write the introduction, including in it background information such as what initiated the report. The discussion should follow a

chronological or logical path. Appendices should contain supporting information too expansive to be incorporated into the body.

To improve your writing skills, consider several good references, such as:<http://bit.ly/2JVBzSQ>; "The Elements of Style" by William Strunk, Jr.; "Eats, Shoots & Leaves: The Zero Tolerance Approach to Punctuation" by Lynn Truss; and "The Associated Press Stylebook" by the Associated Press.

With a little effort and thoughtful study you can get your ideas across. ●

Learn Office Politics

Improving your political savvy can help you survive

By Dirk Willard, Contributing Editor



It seemed like a good move at the time. I was being assigned to participate in a new reactor design project, one that might revolutionize the TiO₂ business. The problem was it took me out of circulation for about 18 months. I should have been learning the ins and outs of the process but instead was dedicated to the development effort. When the company decided to downsize about the time I finished the design project, I became less valuable than others who sat on the sidelines. This outcome is hardly unique.

An engineer at one of the top five U.S. chemical companies was five years from retirement when he agreed to go to China for a year. When he got back he discovered he was out of a job.

Such are the risks of career moves. Sometimes you're damned if you do and damned if you don't. In your career you'll find obstacles you can overcome, those you can go around and others that are insurmountable. The trick is to pigeonhole the challenge and take action.

Let's start by considering a familiar situation for contractors: you're new to a job. Think of it as a challenge. You must prove yourself — but be careful. In the beginning take steps to minimize becoming a target for those who might see you as a threat. Don't reveal any personal details, just talk business; don't be drawn out until you know who you can trust. After you've been there for a few days or weeks, you'll sense who your friends and enemies are. Here's one way to tell: who shares information and



Keep a record of things you did and important memos.

who keeps it from you? Once you figure that out you can put the right hats on the people. Handling your enemies is key to your success.

When I first went to work for Anheuser-Busch I discovered the lab manager saw me as a threat. I made an offhand remark about the value of some of our tests and that was enough. She decided to put me in my place by criticizing a metal detector I had installed. Her complaint went all the way to headquarters in St. Louis. I was under a harsh light. How did I respond? I wrote a detailed report based on statistical data and gave her two copies — one for her and one for her boss. She never handed it in and never bothered me again. In fact, we became friends.

With a little practice, you'll learn to turn around enemies and perhaps outlast them on the job. I've heard of old engineers relegated to the scrap heap who survived longer than handlers assigned to learn from them. Here's their trick: remember the movie "Goodfellas," where the mob boss,

Paul Cicero, always gave instructions verbally? When something could come back to haunt you, use your lips not your pen. If you must write it down, be vague if you can.

Another way to improve your survival prospects is to get into the habit of making a written contract with people, ensuring of course they agree to the terms. You've heard the rest: make yourself indispensable, anticipate your customer's needs and promote your achievements.

What if you're not allowed to become indispensable, though?

I've been there. I was hired to clean up a dozen process details at a refinery. Toward the end, I ran out of things to do. When I pressed, trying to make myself indispensable, I was rebuffed. The refinery only needed me for that job. When you're doomed to be downsized or sacked the only thing to do is document what you did.

One of the greatest dangers in engineering is failure to keep documentation. You're

supposed to leave calculations or design information behind when you leave a company — and you should. But you should keep a record of things you did and important memos regarding regulatory agencies, accidents, etc. About a week before I left a company after a plant renovation we lit off the cooling system in the computer room. We caught the fire at the smoldering stage but refrigerant filled the room before I could turn off the alarm, which had too short a delay, only 5 sec. The insurance company contacted me two months later; I was the odd man out because I no longer worked at

the plant. What saved me from paying the recharge bill was an incident memo I saved. When the insurer called I happily faxed a copy for its records. When I worked at the site the plant manager often complained that I seemed to document everything — I wonder why.

Don't forget that work environment quality is a two-way street. If your boss isn't giving you the support you need, i.e., information, praise, etc., arrange a meeting. If things don't improve, transfer or start looking for another job. Learn politics so you have options. ●

Know When to Leave a Sinking Ship

The unspoken truth about projects is that they all come to an end

By Dirk Willard, senior editor



“Don’t talk about this to anyone.” It was ringing in my ears. Later, I found out that all the project engineers got the same message. There we were working on a Saturday while the manager, who wasn’t a contractor, was enjoying a day with his family. The mood was glum. So, of course, we discussed our reviews and the truth spilled out. We had all been hired for the duration of the project, which, apparently, would end early, in about three months. This was one of my first big shocks as a young project engineer. I was gleefully working 12 to 18 hours a day to build a plant — I would never see it operate. I didn’t handle myself gracefully during the next three months. My attitude changed from upbeat, all-go/no-quit to resentful. Since then, I have learned to see the signs and to leave on good terms.

In my next job, in manufacturing, I was more watchful. I made contacts further up, well beyond my boss. When I joined the company it was in expansion mode, then I noticed a few changes. Contractors started to disappear — the downsizing had begun. Getting a second opinion seemed sensible; I asked one of my bosses if I was in danger. Joe’s response was customarily blunt, “Unless you’re the top guy in the department, I’d be looking.” My annual review confirmed my fears: I was being earmarked for downsizing. Since then, I have talked to other engineers with similar experiences. One young engineer in Delaware had a newborn when trouble began. After six months he had enough and quit.

Unlike many people in the department, I’d been through takeovers, recessions,



I noticed a few changes in the plant a year before trouble began.

downsizings, and worked as a contractor. I'd learned a little about selling myself. Every year, I updated my résumé. I kept a spreadsheet summarizing my accomplishments, including: a description of the work, money saved, my responsibilities, budgets, etc.

An awareness of the economic cycle is important. Knowing when to leave a sinking ship is at least as important as knowing it's sinking. Employment was turning south when the downsizing began in 1997. If I waited a year, I'd be looking for a job during a recession. I decided to act immediately rather than do the best I could and hope I survived a little longer, which is the obvious strategy if the economy is poor.

Several earlier experiences have taught me to cultivate good working relationships with recruiters. Be careful not to "muddy the water," one fellow cautioned. Choose one recruiter for an area and keep that person informed of positions you've applied for. Not all recruiters are the same. The good ones want to know you; the poor recruiters only send forms.

And, most of all: be available for relocation. One senior engineer built a beautiful house and wouldn't leave it. He is still looking for work two years later.

By working diligently, I made my departure in three months; those who stayed suffered through a union strike and a rushed plant turnaround; slowly, painfully, they were sifted out of the company in a process that took more than four years.

Sometimes, the only positions available are with engineering and construction (E&C) firms or in consulting. I took a position with such a firm in Pittsburgh. E&C firms live from contract to contract — robbing Peter to pay Paul. The cash from the last sale pays the overruns from previous projects. Trouble signs are easy to read. When the sales engineers aren't bringing in fresh jobs, that's when you should start considering your future. Another sign is when it takes forever to get the check for travel expenses. Company size is no protection. The best protection is a savvy sales staff. In a recession, smart salesmen "buy the job." That's when

the outfit makes enough money to stay in the game by sacrificing its profit. Our office, at a large firm, went under a few months after 9/11 when our salesmen lost six contracts in a row. At E&C firms, always have your résumé in play with the recruiters.

When the contracts finally ended at the Pittsburgh firm my boss asked me to

complete some project details before leaving in two weeks. Other engineers said forget it. I turned in the work. A few years later, I was hired back in part because of my knowledge of their process but also because I was a professional. Leaving tactfully will not only assure you a good reference but may even lead to future employment at the firm. ●

Should You Work as a Contractor?

Understand the tradeoffs you will face

By Dirk Willard, Contributing Editor

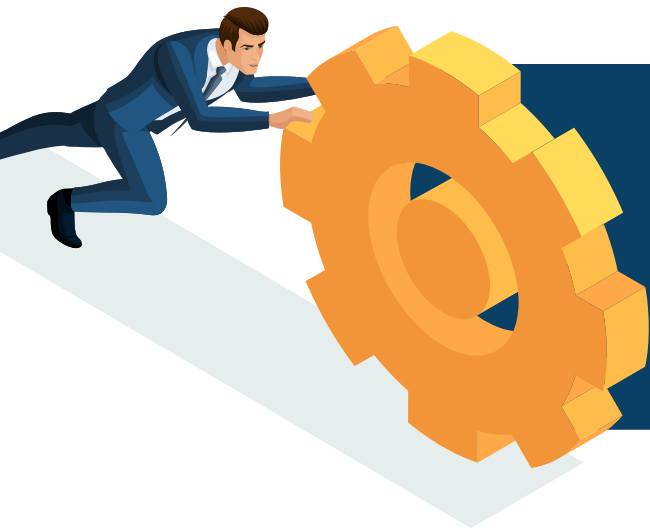


Many people in our profession now seem upbeat about their work and job security, as indicated in this story, “Chemical Engineers Keep On Smiling,” <http://goo.gl/EZVnRT>. However, business goes through cycles, and the “hot” jobs change. So, keeping yourself marketable all the time can pose a challenge.

A key aspect of marketing yourself is deciding whether you want to work as a direct hire or contractor. Direct is attractive if you can stand the competition. The average hiring period is about 60 days; one job cycle took 28 weeks. Interviews resemble job fairs when 16 candidates show up for two positions. Contracting is tempting but you need at least three years of project experience to appeal to companies in engineering/procurement/construction.

So, what are the pros and cons of being a direct hire? The advantages include: 1) a 401k retirement plan; 2) no worries about being billable every minute — so you can initiate improvements if you have an understanding boss; 3) paid vacations, generally 10 or more days per year; 4) perhaps a better health-care plan; 5) some opportunities for formal training; and 6) sick leave. The disadvantages include: 1) a 401k; 2) reduced marketability if you over-specialize; 3) lower net take-home pay than from contracting; 4) usually less travel; and 5) possibly limited on-the-job training experiences.

Why did I list a 401k retirement plan as both a pro and a con? If the plan forces you to buy company shares at \$54 each but you eventually can sell them only for \$13/share,



A contractor may get substantially greater take-home pay.

then you know the downside. I've actually worked at companies where I invested in mutual funds instead of the firm's stock because I knew the outfit was a loser. Here's another thought: unless the company matches your contributions, a 401k is merely a tax-deferred account.

Over-specialization often is a problem for engineers involved in manufacturing. It can mean lower pay than peers and bouts of unemployment when your specialty is out of favor with the marketplace. It's perfectly legal for companies to make offers not based on your achievements and actual value but exclusively on the basis of your past salary — typically, only 0-10% higher than your last job's pay.

So, what are the pros and cons of contracting? The advantages include: 1) higher take-home pay; 2) more travel; and 3) the opportunity to gain broader experience. The disadvantages include: 1) perhaps lower pay; 2) bouts of unemployment; and 3) just on-the-job training.

A contractor will get substantially greater take-home pay by maximizing the per diem to 50% of overall compensation. Based on this, I came up with the following correlation: monthly take-home pay \$ = $34.43 \times$ hourly rate + 528. The curve is contingent on tax deductions for health care and moderate living costs that won't cut into the per diem. (By the way, the Affordable Care Act requires everyone, including contractors, to carry health care insurance. Some employment firms will offer decent plans to meet this obligation. Without it, you'll be stuck with paying at least \$450/month.) Here's one comparison: at a contract rate of \$60/h and assuming a 40-h work week, the breakeven point for net pay compared to an annual salary of \$95,000 with benefits is nine months.

Lower net pay is a factor if you're working as a "1099 contractor" — i.e., the client reports payments on Internal Revenue Service Form 1099 rather than a W2 without per diem. A rule of thumb is that your tax-rate skyrockets to 50% of income for that

sense of independence we all crave. (For more on money-related issues, see my previous column “Avoid Financial Blunders,” <http://goo.gl/oHAbCi>.)

The bouts of unemployment are a challenge because they’re hard to anticipate. Many assignments don’t last the full period. My experience over the past eight years of contracting is that there’s a 50:50 chance that a 6-month assignment will be cut

short; I’ve checked with other contractors and they agree these are typical odds. One of the tough questions you must ask during the phone screen with the company broaching an assignment is: “Am I being hired for one job or are there other jobs I can be re-assigned to while my project is under review by the client?” If no re-assignments are possible and the job is more than 800 miles away, my advice is to decline it. ●

Avoid Job Hunting Pitfalls

Heed a few tips to forestall frustrations

By Dirk Willard, Contributing Editor



I seemed like a shoe-in for the job — even the human resources (HR) manager thought so. However, the company wouldn't consider me because I was already in its system. "What does that mean?," I inquired. It turned out I had filed my resumé on its website some seven years before. Because the firm didn't consider me qualified then, when it now reviewed resúmes for the job it automatically rejected me as unqualified. After the conference call, I told the recruiter I was puzzled by the firm's dismissive approach. I have since learned that it's common practice.

So, my first piece of advice is never file your resumé on a company website — except when you're told to do so by a recruiter because it's the potential employer's policy. Posting it there doesn't set you apart. Your

resumé likely is just one of a few hundred or more that somebody in HR will skim through. The odds the person actually will fish it out are slim at best. Instead, let the recruiter put your name forward, polish your image and interact with the company on your behalf.

My second piece of advice is not to respond to job openings that appear year after year from the same companies. Devote an afternoon every few months to read through the jobs advertised online. It won't take long to spot patterns; avoid firms that regularly relist the same openings. One Chicago company I watch has a habit of hiring a new process engineer every few years because it can't or won't promote and won't give raises. I talked to one engineer who stayed a few years and then left for better prospects. After you get



Always ask why
the job is open.

to know a few recruiters, they'll help you steer clear of such firms.

Along the same lines, some job openings run over and over again. The description changes but that's all. You might think you should apply because the company's finally settled on what it wants. Don't be fooled. Many years ago I applied for a process engineering position in May and, soon after, a revised job description was posted. I thought I was rejected because the description had changed. After seeing another permutation, I chanced to talk to someone at the unemployment office; people there have to give you the straight dope — it's their job. She said the same job had been on its books for over a year. The office sent the company a stack of resumés every few months but nobody got hired. The HR manager was inexperienced and used the resumes to rewrite the job description. I called again a few months later. The HR manager had been fired and the new manager had revised the job description again. Don't waste too much time there.

While we're on the topic of job descriptions, be wary of those that are too specific. I generally send my resumé in anyway because few others will. Be extra-cautious during the phone screen. Ask who wrote the description. If the person says the engineering manager did, you may be sunk because the manager may want skills identical to those of the person who left; if a subordinate wrote it, the description may be designed to hamper hiring a potential competitor for promotion.

Recruiters can get you inside that door but sometimes they're just filling the race stalls. You want to put your time into jobs where you can be a place horse not a show pony. So, do some sizing-up over the phone by asking why the recruiter is interested in you. I once drove two hours in a blinding snowstorm only to find out I was there to give the chosen candidate someone to worry about. While he met the company president in the library, I was relegated to a closet. I was humiliated and told the recruiter never to call me again.

Continue to look even when you've interviewed for a job. Companies often act as though you've got all the time in the world. I was considered for an opening at a gas supplier. The process started in March and ended in September; I was a quarter finalist. Another firm interviewed six candidates for a corporate process control engineer position but then put everything on hold for over six months. The recruiter actually laughed in the phone when the company called back with

its pick. Work as many opportunities as possible when the odds are long.

And, lastly, always ask why a job is open. Once, when I asked that during an interview with a company in Houston, I was told the firm had lost its plant engineer, process engineer and instrument engineer at the same time! Probing further got me nowhere. I was offered the job of plant engineer but turned it down. ●

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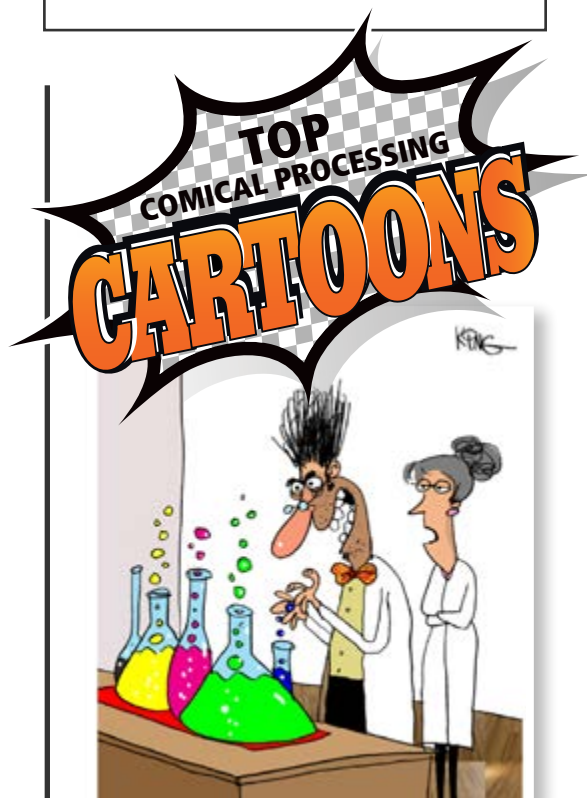
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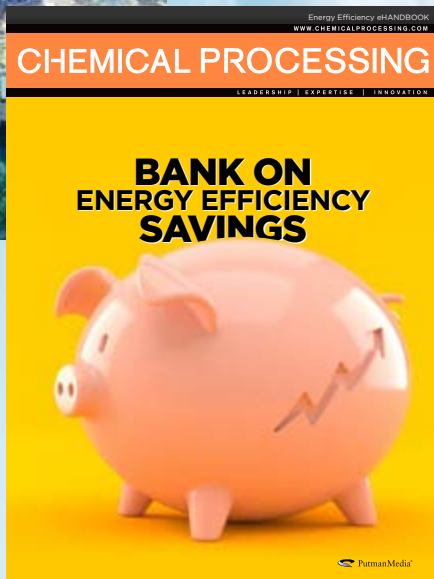
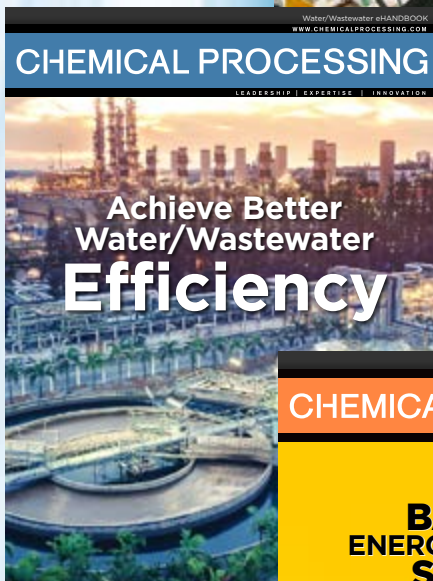
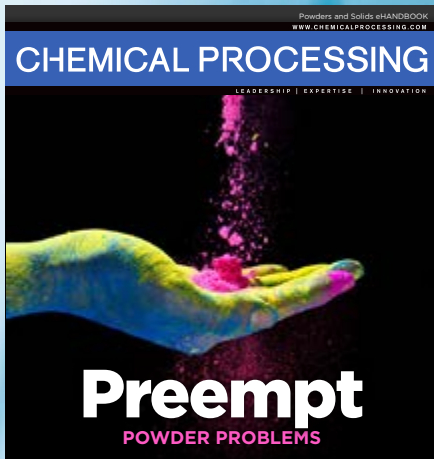
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