THE FUTURE OF

BRASS CITY

PHOTOGRAPHS BY ADAM MINTER

THOUSANDS OF ENTERPRISES IN JAMNAGAR, INDIA, PROCESS AND CONSUME BRASS AND OTHER NONFERROUS SCRAP. THE INDUSTRY'S LEADERS SEE A LARGE-SCALE, HIGH-TECH, ENVIRONMENTALLY SOUND FUTURE THEY HOPE TO BUILD ON GREATER QUANTITIES OF IMPORTED SCRAP.

BY ADAM MINTER

Belt buckles, pen clips, shoe eyelets, electrical connectors, and hundreds of other little-noticed items literally hold together much of the developed world's daily life. Trace back many of these items to their source, and you'll arrive in "Brass City," better known as Jamnagar, population 800,000, in the economically dynamic state of Gujarat in northwest India. For decades, Jamnagar's brass factories have played an important but hidden role in the global economy, consuming much of the world's brass scrap and producing these humdrum but essential goods. Take bicycle tire air valves: One factory alone produces more than 2 million air valves per month, all manufactured from imported yellow brass, which it exports to bicycle tire manufacturers across Asia. Industry sources say the city has 14 more factories just like it, hungry for scrap to meet the world's—and India's—expanding bicycle markets. This city, which was once just another low-cost, environmentally degraded backwater in the global supply chain, is—through fits and starts—becoming a modern, environmentally sound brass recycling and manufacturing powerhouse with aspirations to challenge China.

A worker watches as a hot brass rod is placed into an extruder at Shree Bhavani Extrusion, one of the most technologically advanced brass enterprises in Jamnagar in the Indian state of Gujarat. The city is a hub of brass recycling and manufacturing.

Jai Varudi Enterprises produces 1,200 kg of brass rods per day via the sand-casting process. In the sweltering casting room (above), workers pack sand into casts with their bare feet. A worker (top right) pours molten brass—produced from imported scrap—into the casts. An improvised heat shield protects his feet and lower legs. At right, a worker sorts through the brass rods the company produced that morning and prepares to ship them to smaller companies in and around Jamnagar. In the background, a worker sifts dross for brass fragments, which are then set aside for later heats.

Jamnagar's industrial base has been growing for half a century, first driven by overseas demand, now by India's rapidly growing middle class. The numbers are staggering. The city's 3,000 to 4,000 brass enterprises (nobody can agree on the exact number), which employ more than 150,000 people, import yellow brass at the rate of 300 to 400 containers per month, depending on the season and economic conditions. That's at least one-third of India's total brass scrap imports, says Kanti Joshi, director and owner of Mascot Metal Traders, president of the Jamnagar Exim Metal Merchant Association and Jamnagar's first (and so far, only) member of the Bureau of International Recycling (Brussels).

About 20 percent of the city's scrap comes from domestic sources, the detritus of an expanding manufacturing and consumer economy. Precise figures are hard to come by, though: Each Indian state maintains its own import records, and there isn't yet a reliable national aggregation of those numbers. Like much in India, scrap statistics are the provenance of the wise and observant. Whatever the total volume of domestic scrap, it's not enough to meet the city's explosive growth in demand. As a result, Jamnagar's scrap processors are desperate to forge relationships with suppliers abroad. The challenges are significant: India's scrap importers are notoriously reluctant to pay cash for overseas scrap, and shipping to Jamnagar is far from cheap. For Jamnagar to keep its status as India's brass city, the industry's leaders know these barriers must—and will—be overcome.

CONSUMERS "ARE READY TO MODERNIZE"

Even a casual visitor to Jamnagar notices signs of growth. Farm fields still surround the city, and cows jam the roads and highways, but delivery

trucks now compete with the livestock, and some fields have given way to sprawling housing projects. A bumpy ride through one of the city's many industrial zones reveals small foundries, scrap warehouses, and casting shops that must number in the thousands, though the city provides no official count. The industry is concentrated in two government-sponsored industrial zones. More than 1,100 brass companies occupy every possible corner of Gujarat Industrial Development Corp., Jamnagar's oldest industrial park, founded in the late 1960s, and the one closest to the city's centuries-old downtown.

My host in Jamnagar is Sunil Panchmatiya, import and export director and co-owner of Pooja Metal Industries, a large importer, processor, and manufacturer in the region. Late one morning, as we walk along the muddy streets of GIDC, passing room-sized workshop after room-sized workshop, Pravinbhai Timbadia, the 42-year-old owner of Jai Varudi Enterprises, beckons for me to enter his stifling-hot and dark foundry. Panchmatiya nods with a big smile at the owner and, as we walk inside, he tells me that when he was starting in the scrap business, he and Timbadia were neighbors and trading partners. "This is a very typical Jamnagar-type brass business," he says. "There are thousands like it."

Jai Varudi occupies an uncomfortably cramped but very, very active space in which 20 workers slip out of sandals to use their feet to pack sand into casts. Each cast produces 13 brass rods, each about the diameter of a pencil and 2 feet long. Over an open furnace—which emits smoke, unvented and unfiltered, into the room—a worker dips a ladle into the molten brass and pours it into each cavity in a stack of casts.

Timbadia tells me that his plant has four heats of 300 kg a day, all fed with imported yellow brass scrap that he buys sorted from local traders who have imported it or purchased it from larger traders. He sells the rods to small manufacturers. In total, he clears US$2,000 per month. As I share a cold Thums Up cola with him in his "office"—a desk on the edge of the furnace—he tells me that he's traveling to Portland, Ore., next month to meet his cousin, who owns a Dunkin' Donuts franchise there, with the hope of starting a scrap business focused on exporting to India. "I think there's a good opportunity," he tells me. "Jamnagar needs more and more scrap."

Directly across the street from Jai Varudi, Kanti Joshi welcomes me into the office of Mascot Metal Traders. He nods in the direction of Jai Varudi and the other smoky brass companies on that block and confides that "they're the past. In five years, the city won't be the same. Everything will be modern and clean."

Joshi, an armchair historian of Jamnagar's brass trade, can't pin an exact date on when the city became known for brass. Migrants from other Indian states, who were familiar with steel casting techniques, started some of the original casting shops, he says. Regardless of its origins, Joshi explains why he thinks the industry continues to flourish. The relatively temperate climate "is suitable for casting brass," he says, and the labor force is inexpensive and experienced. "They are born in India, so they are practical. After generations of doing this work in Jamnagar, they can do it better than anyone." The town has 700 smelters alone, he says, most of them small-scale, producing brass for thousands of small manufacturers, with expertise unrivaled anywhere in the world. "They are ready to modernize the industry," he tells me, "and those who aren't will close. Ask Sunil. He will show you."

A worker turns the wheel on a portable, coal-fired foundry beside the road in a Jamnagar industrial park. He is custom-manufacturing a replacement part for a local factory.

It's not unusual for a Jamnagar company to turn scrap brass into new finished products. Bajrang Brass Industries, for example, produces electrical components for India's domestic market. Here, a worker machines parts the company cast from imported scrap earlier in the day.

Later, Sunil Panchmatiya speeds his SUV down the town's two-lane highways, which are jammed with motorcycle rickshaws and herds of cows. He turns onto the muddy dirt roads that wind through Gujarat Industrial Development Corp., Phase 2 (GIDC2), a sprawling industrial park laid out a decade ago and quickly occupied by hundreds of the region's brass factories, warehouses, and workshops. Sunil, a Jamnagar cricket star in his youth, seems to know everybody in town, especially if they're in brass. At the start of my five-day visit, he announces, "I'll show you Jamnagar, from the smallest to the biggest."

As we drive through GIDC2 in search of the smallest, I notice a gaunt laborer seated outside a shipping-container-sized workshop along the muddy road. He's rapidly turning the handle on a smelter the size and shape of a kitchen stand mixer, blowing air on a few pieces of coal that heat up a thumb-sized casting so that he can machine it. Jamnagar has "lots of shops like this one," Sunil tells me, as he brakes hard and rolls down the window so I can take a picture. "They probably do maintenance work for small manufacturers."

A little further up the road we stop at Bajrang Brass Industries' slightly larger warehouse, perhaps the size of three or four shipping containers. A scrawny cow is tied up outside the open shop doorway. Inside, 10 workers are busy machining brass rods into electrical components. Sunil steers me into the dark, musty office, where Hement Gokani, the 37-year-old founder and owner of the company, serves us a sweet, milky tea.

The workers at Bajrang Brass Industries earn a typical Jamnagar rate of between US$60 and US$80 a month. Gokani tells me that he, too, started out as a laborer. That kind of social mobility—going from laborer to owner—is rare. By his estimate, only two out of every 500 laborers "get this far." He has a car, a house, and enough money to send his children to school, he says. "I'm content. I don't need anything else."

To finance that lifestyle, the company manufactures 1,500 kg of brass rod daily, selling about 1,000 kg directly and turning the remaining 500 kg into electrical components it sells into local markets. The workers cast the rods earlier in the day in a small, dark room behind the machine shop, where a brick-lined hole in the ground serves as the company's coal-fired furnace. A mismatched pile of scrap—plumbing fixtures, stripped copper wire, and a few stray electrical parts—sits ready to be melted in tomorrow morning's heat. On average, Bajrang Brass Industries goes through 10 mt to 12 mt of yellow brass scrap—Honey, in ISRI's specifications—each month. The company purchased the scrap from a processor that might or might not have been responsible for importing it to Jamnagar. "Sometimes metal moves around a lot before the foundry," Sunil tells me. "But the material is definitely imported" by one or more of the half-dozen large importers that have been supplying this town's thousands of brass businesses for decades. "I can introduce you to these people," Sunil tells me in an aside. "I know all of them."

THE IMPORTER'S PERSPECTIVE

Sure enough, across town, Sunil introduces me to Ramgopal Maheshwari, managing director of Siyaram Metal Udyog, Jamnagar's largest importer of scrap metal and supplier to hundreds of smelters that are too small to import on their own. On average, Maheshwari tells me, he brokers 1,500 mt of imported nonferrous a month, including yellow brass, zinc, and copper. As Maheshwari beckons us into his office, decorated with gods and other Hindu imagery, Sunil tells me that he bought his first 500 kg of scrap from Maheshwari nearly 20 years ago. "He does many such sales. A very good man."

The family-owned company struggled in its early years in the late 1970s, Maheshwari says, when he started working there as a teenager. Now, at age 46, he watches over a customer base that includes hundreds of buyers in Jamnagar and others in Eastern Europe and China.

What differentiates India's brass industry from China's, he points out, is that China's has grown largely on the basis of export and infrastructure demand, whereas India's is serving the country's own burgeoning middle class. "Consumer demand is growing within India," he says, "so that's the growth around here for scrap. During the economic crisis, we hardly felt anything. Gujarat and Jamnagar stayed strong."

The three of us drive back to GIDC2, and Maheshwari leads me through one of his processing yards. Female sorters in bright saris—a small proportion of the company's 400 total employees—work through the piles of yellow brass filling the yard. Maheshwari's material is all imported, largely from well-known scrap exporters in Europe and the Middle East. "I have agents all over the world, most in Europe," he says. But lately he's had a problem: "European quality is declining," he says. "I even found 150 bags of sand in one [European] load recently."

In general, Maheshwari and his customers prefer North American scrap, both for its quality and its exporters, whom he favors for their transparency and honesty. But North American material is expensive, the shipping times are long (and risky during uncertain markets), and payment terms are difficult for Indian traders, who are loath to pay cash for scrap. Indian importers are interested in relatively small-volume buys on flexible terms. For example, Sunil says Prime Impex, his family's new Dubai-based trading company, prefers to pay a 20-percent

Women (left) sort through some of the 1,500 mt of nonferrous metal that Siyaram Metal Udyog, Jamnagar's largest scrap trader, imports each month. Above, a worker stands with a metal rod he uses to feed scrap into the company's furnace, which incorporates emissions control features such as a bag house.

Workers (above left) unload a container of Middle Eastern brass Honey at Pooja Metal Industries, the Panchmatiya family's brass trading, processing, and manufacturing company. The family's Dubai-based trading company, Prime Impex, facilitates the purchase of Middle Eastern scrap for its own and other companies. In one part of the Pooja facility (above), the standing worker uses his bare feet to pack casts with sand while others remove the cast brass parts from the molds. Sunil and Anil Panchmatiya expect that extrusion will soon replace this production method at their company and throughout Jamnagar.

deposit on material, with the balance due upon delivery, but many U.S. and EU traders won't accept those terms—especially after the broken contracts and losses they experienced during the 2008 market crash. China's aggressive yellow brass buyers, in contrast, are generally more willing to risk paying cash upfront, giving them an instant and longstanding advantage over India's more conservative merchants in the competition for North American and European scrap. That leaves Maheshwari, Panchmatiya, and Jamnagar's other buyers focused on scrap markets in the United Arab Emirates. Its close proximity to Jamnagar, lower prices, and shorter shipping times (delivery can take less than a week) make it an easy place for them to buy and speculate, and the two regions have longstanding commercial and cultural ties as well.

In the long term, both men know they will need to build bridges to the European Union and United States, especially if Jamnagar is going to transform itself from a community of small workshops into a manufacturing center where large-scale enterprises can meet the demands of India's quality-conscious consumers. They realize the importance of a good reputation: With some notable exceptions, Indian importers largely honored their contracts during the 2008 crisis, they say. "If people want to do business, the Jamnagar traders will find a way to do business with them," Sunil Panchmatiya says. "Anyway, it's a small town. If I break a contract, if someone else breaks a contract, the whole town knows about it."

THE QUINTESSENTIAL JAMNAGAR BRASS BUSINESS

For 10 minutes, Sunil Panchmatiya has been watching a hired driver try to extricate a truck and trailer containing a 20-mt load of prime Middle Eastern brass scrap from the mud in front of the driveway of Pooja Metal Industries. Finally, running out of patience, Sunil walks to the front of the rickety old delivery truck, kicks the driver out of the cab, and jams it into gear. The wheels spin, the mud flies, and soon the trailer is backing through the loading doors of Pooja's small warehouse, where workers unload it by hand and shovel and quickly transform the scrap into high-quality brass plumbing fittings suitable for high-end Middle Eastern customers. That's the kind of effort it takes to push Jamnagar's tradition-bound, technology-short brass industry into the modern age.

Inside, Sunil's soft-spoken older brother, Anil, starts his work day with a few sticks of incense that he waves gently through his office, his eyes focused on the small god perched above windows that face the company's 20,000-square-foot facility. Anil wasn't born a brass man. He had a career in real estate, but in 1998 he started a small trading company with his brother that

Pooja Metal Industries exports its brass plumbing fittings (above right) primarily to the Middle East, where they are valued for their quality—especially compared with zinc-rich Chinese products. Workers (above) pack finished fittings for export.

focused on selling Jamnagar's brass components to companies in Mumbai and other Indian cities. Business was strong enough that in 1991 they started a casting plant, and in 1993 they launched a foundry producing 1 mt per day of brass components from scrap. In the mid-1990s, seeing greater opportunities and easier trades, Anil began exporting the company's products. And in 1997, having reached a scale at which he could afford to import, he bought his first load of scrap from Turkey. Since then, the company's scrap needs have only grown. "This factory needs 125 mt per month of brass Honey," Anil says, nodding out the window. "And we import another container of zinc scrap as well."

Anil, the company's managing director, watches over the Jamnagar operations while Sunil spends most of his time in Dubai, where he markets Pooja's high-quality components and those of other Indian manufacturers and manages the export of 20 to 25 containers of brass and other scrap per month through Prime Impex. But Pooja Metal's focus—and growth—is centered in Jamnagar, where Anil oversees a business balanced between the old, polluting method of manufacturing brass and the new, quality-oriented methods that are becoming increasingly common in the city. In many ways, Pooja is the quintessential Jamnagar brass business, and the family offers me complete access to it.

Across from the offices, workers sit on the warehouse floor, sorting a recently arrived load of brass Honey. Hired on a temporary basis when needed for sorting, the men and women work quickly. On the other side of a concrete wall, the sorted brass is piled near the open furnace in the floor. Unlike the smaller Jamnagar furnaces Sunil has shown me, however, Pooja's has a venting system that feeds into a bag house. The equipment is new, the brothers tell me, a result of local and national pollution directives the government has enforced across Jamnagar in the last two to three years in an effort to clean up what most Jamnagar brass men seem to concede is a polluting business. Compliance is not expensive, and the Panchmatiya brothers, like most mid- to large-sized traders in Jamnagar, support the laws and their enforcement. At a minimum, the equipment differentiates their business from the many small, polluting manufacturers who can't afford it—and who might not be able to survive in a few years if they can't comply.

Environmental standards are changing in Jamnagar, but what's not changing is the industry's use of manual labor. At Pooja Metal Industries, workers sort the scrap and load it into the furnace by hand. Across the smelting room, they use their bare feet to pack sand into casts that get filled with molten brass. After the castings cool, these same workers knock the new brass pipe fittings out of the casts. It's admittedly low-tech, but the Panchmatiyas and other Jamnagar businessmen insist that superb, handmade quality is the result. And quality, they tell me, is what differentiates Jamnagar's products from China's. China might have gotten the faster start, they say, but Jamnagar's commitment to better-quality alloys and craft is giving the city—and the country—a boost in the international markets. Sunil, back in his office, tells me that his customers in Dubai complain

Bales of domestically generated brass oil cans (below) arrive at Shree Bhavani Extrusion. Most of the company's scrap source material comes from imports, which it needs to meet scrap demand that has more than tripled since it switched from sand casting to extruding. Brass rods (right) emerge from the extruder, which the company can fit with a variety of dies (center right) to produce different product shapes. One reason the company switched to extruding was to gain this flexibility to meet changing customer demand. Workers (bottom) pack the finished rods for shipment. The company's minimum order is 500 kg, but as Jamnagar grows, larger orders from modern manufacturers are eclipsing the smaller ones.

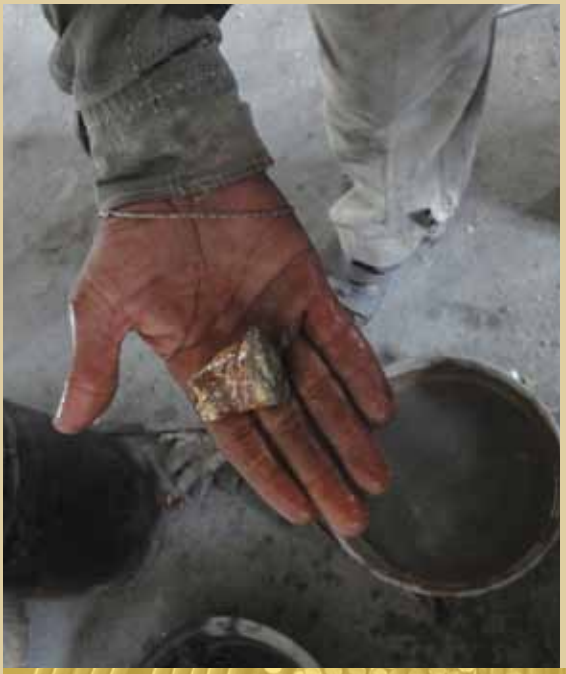
about the high zinc content in Chinese brass plumbing fixtures. "We don't do that in Jamnagar. That's not how we compete."

Across from the smelting and sorting warehouse is another furnace. Next to it, a worker sifts the dross for brass fragments, which get fed back into the smelting cycle. Next door, Pooja operates an electroplating facility, and beside it is a polishing room where workers burnish shiny brass plumbing fixtures before they pack them for shipment to Dubai. The entire cycle—from scrap to packaged product—would be unusual and expensive anywhere else in the world. But in Jamnagar, it's not only possible, it's an expected scope of operations once a company reaches a certain scale.

It's hard to reconcile this commitment to handmade products with the scale of production Jamnagar brass industry leaders envision in their future. With its economy spurred by strong consumer demand for quality brass plumbing and electrical equipment in the UAE, other Gulf states, and domestically, "Jamnagar is going to be a megacity," Anil predicts. But more than that, it's going to be a modern manufacturing mecca—one with Indian characteristics. Computer-controlled (CNC) machine tools are coming to Jamnagar, and "extrusion plants are here," he tells me with enthusiasm—"more than 50 already; another 50 to come." In five years, Anil assures me, there will be no small foundries in Jamnagar. Pollution controls will extinguish them if market forces don't do it first. Smaller casting plants will still serve smaller manufacturers (say, those that manufacture 1,000-piece orders), but the future is "big houses, all infrastructure under one roof," he says. And no small, coal-fired sand-casting plants. This goes for Pooja Metal Industries, too: "This plant lasts another three to five years," Anil says, "and then we convert entirely to our new facility."

A LOOK AT JAMNAGAR'S FUTURE

Pooja's new facility is still a large field—one that has appreciated considerably since Anil purchased it and the state government designated it and a large parcel of land around it as GIDC3. Sunil drives me past the empty field and then stops hard beside a large new warehouse that belongs to Shree Bhavani Extrusion. It's precisely the kind of factory Pooja will operate on its new plot of land, he tells me, and it's the only kind you'll find in Jamnagar in a few years. "You want to see this factory?" he asks. "It's my friend's. C'mon."



Shree Bhavani's new, modern furnace allows it to control material chemistry and quality in a manner that's new for Jamnagar's brass industry. Here, workers produce a small sample ingot for testing in the company's new lab.

I follow him into the loading area, where workers are loading 500 kg of new brass rods onto small trailer attached to a motorcycle rickshaw. Sunil speaks to the driver and then explains that the load is going to a small electrical component manufacturer that supplies the local housing market. Beyond the loading dock I can see a long warehouse in which dozens of workers are cutting, polishing, and tying together rods extruded in a variety of shapes.

Kamlesh Jobanputra, the managing director of Shree Bhavani, is clearly proud to lead a reporter through this year-old plant—built, he tells me, to expand, modernize, and fortify his family's 25-year-old business. "For most of our history we had a coal-fired foundry and made components," he tells me. "And then we learned that coal-fired plants have no future."

We pass an unloading area, where a forklift is removing pallets containing small bales of domestically sourced brass oil cans from a flatbed trailer. Nearby lie sacks of brass shavings also sourced locally. Jobanputra mentions that he buys significant quantities of No. 1 copper and zinc scrap locally as well. But that's just the start of his material needs. He also imports three containers of Honey each month and—as the market allows and his needs dictate—quantities of copper and zinc. Since opening the new plant, his material

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needs have tripled, and he expects them to at least double again in the near term.

"This is why," he says, pointing at the platform atop his 375-kW, Indian-manufactured electric furnace. We climb the stairs and stop beside several workers in sandals and shirtsleeves feeding baled oil cans into the smoking furnace, stuffing them in with long steel pokers. Above the melting scrap, a large blower drives the smoke and fumes into a bag house. But it's quality, not pollution control, that most concerns Jobanputra. "If you need 57.2-percent copper content, we can do that," he tells me. "Before, when we only had a coal-fired plant, we couldn't and lost a lot of money. Now we don't have the loss. Instead, we have new, bigger customers." Nearby, I notice, are sheets of lead and small piles of zinc scrap for the mix. "We have a uniform product, and we can compete with anyone," Jobanputra says. "With a modern plant, I can compete with China." Needless to say, this is a big step up from sand casting—even high-quality, Jamnagar-style sand casting.

Shree Bhavani imports its scrap through trusted agents like Sunil. "They wouldn't just import from somebody they've never met before," he explains. "They want to know that somebody they know is involved in the trade." As a result, Sunil's Prime Impex office in Dubai is a magnet for scrap-hungry Jamnagar traders who want imported metal but don't have the personal relationships abroad to trade it themselves. "So they trust me instead," Sunil says. "Jamnagar is a small town. If you want to trade into Jamnagar, you need someone who's known in Jamnagar."

Late on a weekday afternoon, Mascot Metal Traders' Kanti Joshi leads me out of his office to a small receiving yard, where a motorcycle rickshaw is awaiting a shipment it

will deliver elsewhere in the city. Joshi tells me that he learned the business at a scrapyard on 163rd Street in the Bronx, N.Y., in the 1970s. "I was paid with a sandwich and two coffees per day," he says with a smile. He returned to India and started importing in 1978. Today his son handles the family's wide-ranging business interests, and Joshi is free to look up at the sky—and a cloud of coal dust pouring out of a nearby smokestack. "In two years, the pollution department will cut off [the owners'] noses if it sees that," he says. "The old ways of Jamnagar are coming to an end. The future is the big plant and electric furnace. There will still be some small plants, but they'll need to be clean."

The Indian government's heavy-handed regulatory tradition has long been blamed for stunting the growth of the country's industries. Joshi is quite aware of the danger that Jamnagar faces if regulation reaches the city too fast. "Look at old Manchester in England," he says. "It was entirely shut down because of environmental regulations." To his way of thinking, it would be better, and safer, if education—rather than regulation—changed Jamnagar. "You need to teach people what the consequences are if they pollute. The pollution control measures are moving too fast. We've asked the government for more time."

Back in his office, he points to a picture of him with India's environmental minister. "In 10 years," he says, "Jamnagar will be completely different." Sunil enters the office to see if we're done speaking, and he tells us not to rush. "I'm talking some business outside," he tells us. "Take your time."

Adam Minter is a journalist based in Shanghai, where he writes about business and culture for U.S. and international publications. He also maintains a blog at www.shanghaiscrap.com.