United States Court of Appeals for the Federal Circuit

00-1143
(Reexamination Nos. 90/002,920, 90/002,980, 90/003,228, 90/003,233, 90/003,645, 90/003,679, and 90/003,791)

IN RE INLAND STEEL COMPANY

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DECIDED: September 19, 2001

Before NEWMAN, RADER, and BRYSON, Circuit Judges.

BRYSON, Circuit Judge.

On reexamination of a patent owned by Inland Steel Company, the Patent and Trademark Office rejected all the claims of Inland’s U.S. Patent No. 4,421,574 (“the ’574 patent”) as obvious under 35 U.S.C. § 103. Inland has appealed with respect to nine of the claims. We affirm.

I

The ’574 patent issued in 1983. In 1991, Inland sued USX Corporation and LTV Steel Company, Inc., alleging infringement of the ’574 patent. While that lawsuit was pending, USX and LTV filed requests for reexamination of the ’574 patent. The Patent and Trademark Office granted those requests, and the district court stayed further proceedings pending the outcome of the reexamination proceeding.

Following the reexamination, the examiner rejected all claims of the ’574 patent as either anticipated or obvious. After the final rejection, Inland cancelled claims 1-8 and appealed the rejection of the remaining claims, claims 9-17, to the Board of Patent Appeals and Interferences. The Board sustained the examiner’s rejections under 35 U.S.C. § 103 based on a variety of prior art combinations, including U.S. Patent No. 4,390,378 (“Rastogi”) and U.S. Patent No. 4,204,890 (“Irie”).

The appealed claims are directed to a method of producing cold-rolled electrical steel that has improved magnetic properties. Electrical steel is designed to carry magnetic flux in electrical products such as motors and transformers. Three magnetic properties that are commonly used to grade electrical steel are core loss (a measure of the steel’s loss of energy within the electrical core), permeability (a measure of the steel’s capacity to carry magnetic flux), and magnetic induction (which is directly proportional to permeability). Producers of electrical steel strive to obtain compositions that exhibit low core loss and high permeability.

In general, cold-rolled steel is produced by forming molten steel into thick slabs and then converting the slabs into thinner strips by a series of hot-rolling steps (rolling at an elevated temperature). The thin strips are then cooled to room temperature and reduced to nearly their final thickness by a series of cold-rolling steps (rolling at room temperature).

During the processing that follows hot rolling, the steel strip is conventionally subjected to an annealing operation in which the steel is heated and then slowly cooled. That annealing step may be performed either (1) between the hot-rolling and cold-rolling steps, (2) between stages of multiple cold-rolling steps, or (3) after the completion of cold-rolling. Annealing that is performed between the hot-rolling and cold-rolling steps is called hot-band annealing.

The prior art taught that adding silicon and aluminum to the steel mixture improved the steel's magnetic properties. However, adding silicon and aluminum had the disadvantage that an annealing step designed to eliminate carbon in the steel (the "decarburizing anneal") would cause an undesirable layer containing oxides of silicon and aluminum to form near the surface of the steel. That layer reduced the improvements in magnetic properties otherwise obtained from the addition of silicon and aluminum.

The '574 patent addressed that problem by proposing the addition of antimony during the preparation of electrical steel. The addition of antimony, according to the patent, causes an antimony-enriched layer to form adjacent to the surface of the metal, which reduces the depth of the oxidation layer, thus improving the magnetic properties of the steel.

Representative claim 9 of the '574 patent recites a process for using antimony in making electrical steel:

> 9. A method for producing a cold rolled, temper rolled strip of electrical steel containing silicon and aluminum and which will suppress the formation of an internal oxidation layer containing oxides of silicon and aluminum adjacent the surface of said cold rolled steel strip during subsequent decarburizing after temper rolling, said method comprising the steps of:
> providing a steel composition consisting essentially of, in wt.%:
> carbon: up to 0.06,
> manganese: 0.20-0.75,
> silicon: 0.15-2.50,
> aluminum: 0.15-0.50,
> phosphorus: 0.12 max.,
> sulfur: 0.02 max.,
> antimony: 0.02-0.10 wt.%,
> iron: essentially the balance,
> hot rolling said steel into a strip;
> coiling said strip at an elevated temperature and then cooling the coiled strip;
> cold rolling said strip;
> annealing said strip after said cold rolling step, at a strip temperature which

> forms an antimony enriched layer at, and immediately adjacent, the surface of said strip;
> there being no annealing step after said hot rolling step and prior to the completion of cold-rolling;
> and temper rolling said strip after annealing;
> there being no substantial reduction in the carbon content of said steel in any of said steps through said temper rolling step.

Claim 9 and the claims that depend from it preclude any annealing step during the period after hot rolling but before the completion of cold rolling. By excluding annealing during that time, the claimed process minimizes antimony depletion, thus preserving the antimony-enriched layer that inhibits the formation of the oxidation layer. See '574 patent, col. 2, ll. 60-68.

The primary reference on which the examiner and the Board relied was the Rastogi patent, which was also assigned to Inland. Rastogi's claim 1 recites:

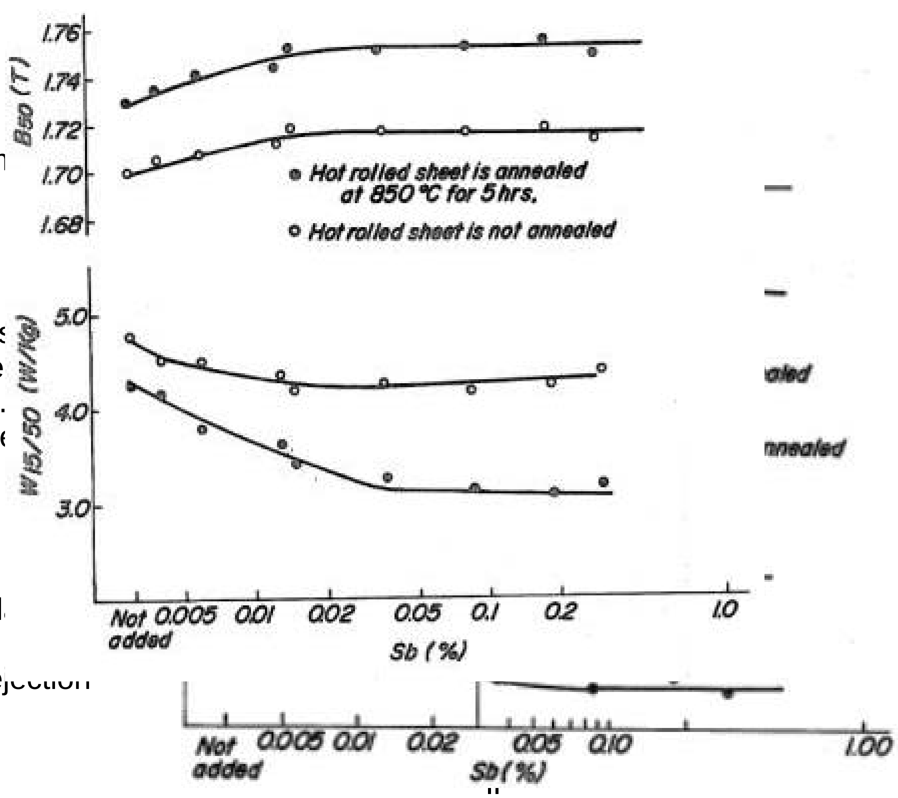
> l. In a method for producing cold rolled steel strip for use in electric motor core laminations, the steps of:
> providing a steel consisting essentially of the following composition in wt.% before cold rolling:
> carbon: 0.05 max.
> manganese: 0.50-0.70
> silicon: 0.85-1.05
> aluminum: 0.20-0.30
> phosphorus: 0.08 max.
> sulfur: 0.02 max.
> iron: essentially the balance;
> hot rolling said steel into steel strip;
> coiling said hot rolled steel strip while the steel is at a coiling temperature in the range 1250°-1400° F. (682°-760° C.) and then allowing said coiled strip to cool;
> cold rolling said steel strip;
> continuously annealing said steel strip at a strip temperature in the range 1250°-1400° F. (682°-760° C.) for about 2-5 minutes, and then allowing said strip to cool;
> and temper rolling said strip to produce a reduction of about 6-8.5%;
> whereby said steel strip, after said temper rolling step, has a grain size and crystallographic orientation which, upon subsequent magnetic annealing at a temperature in the range 1400°-1550° F. (760°-843° C.) for about 1-2 hours in a decarburizing atmosphere, produces an average ferritic grain size of about 4.0-5.0 ASTM and a preponderance of crystallographic planes containing the easiest direction of magnetization.

The Board found (and Inland concedes) that Rastogi teaches all of the process and compositional limitations of the claims of the '574 patent except for the addition of antimony.

The main secondary reference on which the Board relied was Irie, which is directed to a method of making steel with excellent electromagnetic properties. Irie's claimed method involves the use of a hot-band anneal and adding antimony in the amount of 0.005% to 0.3% by weight.

Before the Board, Inland argued that Irie teaches that antimony improves magnetic properties only in combination with a hot-band anneal. For that reason, according to Inland, Irie does not teach one of skill in the art to add antimony to Rastogi and thereby obtain the invention of the '574 patent. The Board, however, found that Irie teaches the use of antimony to improve magnetic properties not only when hot-band annealing is employed, but also in the absence of a hot-band annealing step. For support, the Board cited two figures from Irie and the accompanying text from the specification describing the figures. The two figures, Figure 2 and Figure 3, are reproduced below:

FIG.2



The text from ... n Figures 2 and 3 provides:

> It can ... f Sb [antimony] is increas... is decreased, and this te... nealed before cold rolling. ... an addition amount of at l... of at least 0.03%.

Irie, col. 3, ll. ... Rastogi, the Board found that cl... erefore upheld the examiner's rejection

A

Inland's principal argument on appeal is that the Board was wrong to conclude that Irie teaches the use of antimony in the absence of hot-band annealing. Inland points out that while Irie reports some improvement in the magnetic properties of steel from the addition of antimony in the absence of annealing, it reports much greater improvement when the steel is subjected to a hot-band anneal. As a result, Inland argues, a person skilled in the art would conclude from Irie that antimony enrichment is useful when combined with annealing, but not that antimony enrichment is useful in general. For that reason, Inland argues, there is no motivation to combine Rastogi, which precludes annealing, with Irie, which requires annealing.

While acknowledging that Irie's principal focus is on the addition of antimony in conjunction with hot-band annealing, the Board found that Irie nonetheless teaches that "the addition of antimony to a steel composition improves the magnetic properties of the steel, even in the absence of a hot band annealing step." That finding is well supported, as Irie makes clear that the addition of antimony results in improvements in the magnetic properties of steel, even though those results are "effectively improved by proper annealing." Irie, col. 3, ll. 3-5. Figures 2 and 3 of Irie's specification illustrate the improvements that result from the addition of antimony and from the subsequent annealing of the antimony-enriched steel. Irie claims only the combination of the two steps, but the benefits of each are disclosed. In describing Figures 2 and 3, Irie states that when the amount of antimony added to the steel is increased, the magnetic properties are improved, an improvement that is enhanced by hot-band annealing. Irie, col. 3, ll. 47-52. Antimony, Irie reports, "is effective for improving the property of the final product in an addition amount of at least 0.005%, and is particularly effective in an addition amount of at least 0.03%." Irie, col. 3, ll. 52-55. Thus, Irie's recitation of the benefits of the preferred procedure, which includes annealing, does not undercut Irie's teaching that adding antimony is useful even in the absence of annealing.

Inland asserts that the experimental results depicted in Figures 2 and 3 of Irie indicate that Irie's reported improvements in the magnetic properties of electrical steel from adding antimony without annealing level off when the concentration of antimony reaches 0.02%, which is the lowest level of antimony concentration recited in the '574 patent. The Board, however, interpreted the data in Figures 2 and 3 and the passage from Irie quoted above to teach that even when steel is not annealed, the addition of antimony leads to an improvement in the magnetic properties of steel, and that the improvement "is particularly effective" in amounts of at least 0.03% by weight, which is within the range set forth in claim 9 of Inland's patent.

Substantial evidence supports the Board's interpretation of Irie. Both the cited passage from Irie and the two figures reproduced above are fairly subject to the interpretation adopted by the Board, and there was no compelling evidence before the Board to the contrary. The fact that Irie teaches that annealing in addition to adding antimony produces optimal results does not negate Irie's additional teaching that adding antimony is effective even in non-annealed steel. See In re Boe, 355 F.2d 961, 965, 148 USPQ 507, 510 (CCPA 1966) (all of the disclosures in a reference, including non-preferred embodiments, "must be evaluated for what they fairly teach one of ordinary skill in the art"); Merck & Co. v. Biocraft Labs., Inc., 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir. 1989) ("the fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered") (quoting In re Lamberti, 545 F.2d 747, 750, 192 UPSQ 278, 280 (CCPA 1976)). The absence of the further advantage that Irie associates with annealing is not a "disadvantage," as Inland suggests, and therefore Irie cannot be regarded as teaching away from the use of antimony in non-annealed steel.

The cases on which Inland relies, particularly In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000), and In re Langer, 465 F.2d 896, 175 USPQ 169 (CCPA 1972), are inapposite. In Kotzab, one temperature sensor controlled multiple valves for coolant flow in an injection molding system for forming plastic articles. The prior art device had multiple valves, each controlled by its own temperature sensor. The court held that there was no substantial evidence of how or why a prior art reference disclosing a one-sensor-to-one-valve system would motivate one skilled in the art to use the one-sensor-for-all-valves system. In this case, unlike in Kotzab, Irie discloses the exact element at issue (the use of antimony in electrical steel without annealing) and Irie discloses the motivation for using the antimony (to improve the magnetic properties of the steel).

Nor does In re Langer support Inland's argument. In Langer, the court reversed the Board's rejection of a patent application that involved using sterically hindered amines in a process for co-polymerizing certain hydrocarbons in the presence of a particular catalyst. The court held that the prior art patent on which the Board relied did not render the applicant's invention obvious. The court explained that the prior art patent's reference to "an isolated hindered amine falling outside the scope of appellants' claims does not, by itself, apprise the ordinary artisan of the significance of hindered amines as a class." Langer, 465 F.2d at 899, 175 USPQ at 171. The quoted language reflects three distinctions between Langer and this case. First, Irie's discussion of the use of antimony in non-annealed steel is not merely an "isolated" reference in the prior art patent. Second, the levels of antimony usage discussed in Irie overlap the ranges in Inland's claims. Finally, and most importantly, Irie apprises an ordinary artisan of the significance of using antimony—to improve the magnetic properties of steel.

B

Inland next argues that one skilled in the art would not be motivated to combine Irie with Rastogi, because the results that Irie reports from adding antimony to non-annealed steel are not as favorable as the results achieved from the Rastogi process alone. The point of Irie's teaching, however, is not that it demonstrated that adding antimony without annealing led to an improvement in magnetic properties to a certain level, but that it demonstrated a relative improvement in those properties compared to the same process without antimony. A relative improvement of the sort taught by Irie would suggest that a similar relative improvement in the results from Rastogi could be obtained by adding antimony to the Rastogi process.

The motivation to combine particular references may come "from the nature of the problem to be solved, leading inventors to look to the references relating to possible solutions to that problem." Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996); see also In re Huang, 100 F.3d 135, 139 n.5, 40 USPQ2d 1685, 1688 n.5 (Fed. Cir. 1996). In this case, Rastogi and Irie both focus on the same problem that the '574 patent addresses: enhancing the magnetic properties of electrical steel. Moreover, both Rastogi and Irie come from the same field of art: the composition of steel with good magnetic properties. Finally, the solutions to the identified problem found in the two references correspond well. Rastogi describes a composition of steel that exhibits good magnetic properties when produced without annealing. Irie teaches that, in compositions of steel similar to Rastogi, the addition of antimony in amounts covered by the claims of the '574 patent improves the magnetic properties of electrical steel even absent annealing. Given the close relationship between the problem, the applicable art, and the proposed solutions addressed in Irie and Rastogi, we conclude that substantial evidence supports the Board's finding that there was a motivation to combine the two references.

C

Inland next contends that even if one of skill in the art contemplated combining Irie and Rastogi, there would be no reason to expect that the combination would succeed in producing improved magnetic properties in electrical steel. For that reason, Inland argues, the combination of Irie and Rastogi did not render the invention of the '574 patent obvious, but at most simply suggested a path of inquiry for an inventor to try. Inland argues that steel-making is an inherently unpredictable art and that the differences in the formulations disclosed in Irie and Rastogi make it unreasonable to assume that results would be transferable from one process to the other.

Inland's argument that specific differences in the steel chemistry between Irie and Rastogi would have led those skilled in the art to discount Irie's teachings is unpersuasive. To begin with, as the table below shows, the claimed ranges of the components of the Irie and Rastogi formulations overlap each other and overlap the claimed ranges of the '574 patent components as well.

	Irie Claim 1	Rastogi Claim 1	'574 Claim 9
Carbon	<= .02%	<= .05%	<= .06%
Sulfur	<= .007%	<= .02%	<= .02%
Silicon	0.5 to 3.5%	0.85 to 1.05%	0.15 to 2.5%
Aluminum	0.1 to 1.0%	0.20 to 0.30%	0.15 to .50%
Manganese	0.1 to 1.0%	0.50 to 0.70%	0.20 to 0.75%
Antimony	.005 to .30%	Not discussed	0.02 to .10%
Phosphorus	Not discussed	<= .08%	<= .12%

Inland notes that Irie and Japanese Patent Application 50-98425 ("Nakazato"), on which the Board also relied, use low levels of carbon and recognize the difficulty of using a decarburizing anneal to reduce high amounts of carbon in a steel composition. According to Inland, since Rastogi permits the use of higher carbon levels (combined with a subsequent decarburization anneal), there would be no reasonable expectation of success from a steel-making process that used high levels of carbon but did not employ hot-band annealing.

The Rastogi process, however, is not limited to high-carbon steel. The claims of Rastogi do not recite a minimum amount of carbon, and the written description of Rastogi specifically contemplates steel that is made with lower levels of carbon: "Where the steel has an initial carbon content of .05 wt. % max, there is no need for a decarburization anneal between the hot-rolling and cold-rolling steps." Rastogi, col. 3, ll. 33-35. For that reason, at the lower portion of Rastogi's range that overlaps Irie, one skilled in the art would reasonably expect success from combining the two references.

The flaw in Inland's carbon-level argument is particularly evident in light of the claims and the written description of the '574 patent. Because the claims contain no lower limit on the amount of carbon, the claims overlap the cited prior art. See In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990) (noting that claimed ranges that overlap the prior art create a prima facie case of obviousness that must be rebutted by the applicant); In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974) (claimed carbon range in steel-making process was rendered prima facie obvious by teachings of prior art ranges touched by the claimed range). The written description of the '574 patent also contemplates the use of lower levels of carbon, as it notes that "[v]acuum degassing reduces the carbon content to about 0.005 wt. %, and such a steel would probably not require a decarburizing anneal after cold rolling. . . ." '574 patent, col. 5, ll. 57-60.

Inland makes similar arguments with regard to the concentrations of other components: sulfur, silicon, manganese, phosphorus, and antimony. With respect to the amount of sulfur, the '574 claims encompass Irie's sulfur range, so Irie's steel chemistry is not different from that of the '574 patent in that regard. With respect to silicon and manganese, Rastogi's claimed ranges are subsets of Irie's claimed ranges, as are the ranges of the '574 patent. Irie does not discuss phosphorus, but Inland points to nothing in the record suggesting that the absence of phosphorus in the Irie formulation would have any effect on the expectation of success—particularly in light of the statement in the ’574 specification that a high phosphorus content makes it difficult to hot roll the steel, most especially in the presence of antimony. ’574 patent, col. 3, ll. 53-57.

The potentially negative effects of adding excessive amounts of antimony, which are noted in some references, do not undermine the conclusion that there was a reasonable expectation of success from the combination of Irie and Rastogi. The Nakazato reference specifies antimony ranges of 0.005% to 0.03% and notes that antimony concentrations greater than 0.03% present problems and do not appreciably improve the magnetic properties of the steel. Irie teaches that antimony is effective at a concentration of 0.005%, is “particularly effective” at a concentration of at least 0.03%, but could cause the steel to crack when the concentration is increased to 0.40% or above. Thus, while the prior art teaches that adding antimony is beneficial only within certain ranges, those ranges overlap or include the range recited in the ’574 patent. Nakazato’s useful range intrudes into the lower part of the ’574 patent’s claimed range, and the antimony range of 0.02% to 0.10% in claim 9 of the ’574 patent almost exactly matches Irie’s teaching that “[p]articularly, when the Sb content is 0.015-0.15%, a good result is obtained.” Irie, col. 4, ll. 52-53. Irie’s warning about excessive antimony levels does not undermine the expectation of success from combining Irie with Rastogi, because the antimony concentrations in the ’574 patent are substantially below the 0.40% level as to which Irie expressed caution.

In its brief, Inland compares the claims of the ’574 patent to the embodiments described in Irie and Rastogi. As would be expected, the comparison of embodiments resulted in more differences than the comparison of the claims of the ’574 patent to the claims of Irie and Rastogi, because the claims are not limited to specific embodiments. A comparison with the claims of Irie and Rastogi is more appropriate because there is no showing that the specific embodiments display any particular characteristics that are not present across the entire claimed ranges. See , e.g. , Ultradent Prods., Inc. v. Life-Like Cosmetics, Inc., 127 F.3d 1065, 1068, 44 USPQ2d 1336, 1339 (Fed. Cir. 1997) (error to construe prior art disclosure as limited to the preferred embodiment).

In sum, the prior art references identify a common problem (improving magnetic properties), and one of the references gives a specific example of a single critical parameter (the addition of antimony) and gives explicit guidance tying that parameter to the key parameter of another reference (steel prepared without hot-band annealing). The Board reasonably concluded that the strength of the correlation between the references gives rise to a reasonable expectation of success from combining them.

D

On the assumption that the Board properly found a prima facie case of obviousness, Inland seeks to overcome the prima facie case by showing that the particular levels of antimony used in the ’574 claims achieved unexpected results. Inland contends that even accepting that one of ordinary skill in the art would expect that adding antimony to non-annealed steel would improve the magnetic properties of the steel, the addition of antimony within the particular ranges claimed in the ’574 patent produces a dramatic improvement in magnetic properties that a person of skill in the art would not have anticipated.

Before the Board, Inland made two arguments directed to this point. First, it attempted to show that even though the claimed range in claim 9 of the ’574 patent (0.02-0.10%) was within the range disclosed in the Irie prior art reference (0.005-0.30%), the range claimed in the ’574 patent was “critical,” in that unexpected results were obtained in that specific range. See, e.g., In re Geisler, 116 F.3d 1465, 1469-70, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); In re Woodruff, 919 F.2d at 1578, 16 USPQ2d at 1936. Second, it asserted that data disclosed in the Irie reference showed that the favorable effect of antimony on magnetic properties leveled off at concentrations above 0.02%, while the effect of antimony on the steel produced pursuant to the ’574 patent process showed continuing improvements in magnetic properties at concentration levels above 0.02%.

On appeal, Inland has abandoned the range-criticality argument and focuses instead on the leveling-off argument. In pressing that argument, Inland relies heavily on the declaration of the inventor, Grigory Lyudkovsky, and in particular on one set of data incorporated in that declaration. Inland argues that the data in question shows that adding antimony in concentrations between 0.02% and 0.05% produces increasing improvement in the magnetic properties of steel made by the ’574 patent process. That improvement, Inland argues, would have been unexpected in light of the experimental results disclosed in the Irie patent.

In a portion of his answer that the Board expressly adopted as part of its grounds for decision, the examiner addressed the Lyudkovsky declaration and discounted it on several grounds. First, the declaration was not sworn; for that reason, the examiner concluded that it was entitled to little, if any, weight. Second, Lyudkovsky did not compare the claimed process to Irie, the closest prior art. Third, the Lyudkovsky materials that were before the examiner contained at least one error in which Lyudkovsky confused steel containing antimony with steel containing no antimony, an error that led the examiner to question the dependability of the internal memos on which the Lyudkovsky declaration was based. Fourth, the examiner noted that the data on which Inland relies is “not commensurate with the scope of Inland’s claimed invention”—that is, the data in Lyudkovsky’s report reflected results obtained with a particular alloy composition prepared with specific process steps and specific process conditions, while the claims were not so limited, and there was no basis for assuming that similar results could be obtained with other compositions and processes within the scope of the claims.

In addition, the Board rejected Inland’s contention, based on Figures 2 and 3 of Irie, that Irie’s process without annealing produced no additional improvement in magnetic properties at antimony concentrations of more than 0.02%. The Board based that finding on a declaration by Dr. Marder, an expert witness for one of the requesters, who offered evidence that steel prepared by the Irie process provided resistance to internal oxidation that was equivalent to or even greater than that of steel prepared according to the ’574 patent process, at antimony concentrations between 0.037% and 0.084% (for Irie’s steel) and 0.027% and 0.048% (for Inland’s steel). Resistance to the formation of an internal oxidation layer, which the prior art article by Morito identified as an advantage of using 0.02% antimony in a silicon-containing steel, is the chemical characteristic identified in the ’574 patent as the objective of the Inland process and as a cause of the improved magnetic properties of the steel prepared by that process. Based on all the evidence before it, the Board found that Inland had not satisfied its burden of overcoming the strong prima facie showing of obviousness by demonstrating that the ’574 patent disclosed unexpected results in the claimed ranges of 0.02%-0.10% and 0.04%-0.10% antimony concentration.

Lyudkovsky’s data regarding the permeability of semi-processed steel, which is the focus of Inland’s appeal on this issue, consists of sample points at four antimony levels between zero and 0.051%. Although the last two of those data points suggest improved magnetic properties at antimony levels above 0.02%, the examiner and the Board were understandably skeptical. Much of the data that was before the Board undercuts Inland’s assertion that it had established improved performance in the range above 0.02%. Throughout the re-examination process, the examiner expressed concern that insufficient data had been presented to prove the unexpectedly favorable results in the ’574 patent’s claimed antimony ranges, because Inland offered only a few data points from one experiment comparing antimony within and below its claimed ranges. Despite those concerns, Inland did not offer comprehensive test results for the magnetic properties of steel produced under the ’574 claims at antimony levels greater than 0.02%.

In the end, the Board’s determination with regard to Inland’s claim of unexpected results at antimony levels greater than 0.02% turned on its weighing of the evidence of record. An examination for unexpected results "is a factual, evidentiary inquiry," In re Mayne, 104 F.3d 1339, 1343, 41 USPQ2d 1451, 1455 (Fed. Cir. 1997), and we give the Board broad deference in its weighing of the evidence before it. The question is not whether Inland's preferred data could support a conclusion that unexpected results were shown, but rather whether an "examination of the record as a whole, taking into consideration evidence that both justifies and detracts from an agency's decision" would provide a reasonable mind with an adequate basis to support the Board's conclusion. In re Gartside, 203 F.3d 1305, 1312, 53 USPQ2d 1769, 1776 (Fed. Cir. 2000). Under that standard we are satisfied that the Board permissibly concluded that Inland failed to demonstrate that its process produced unexpectedly favorable results at the antimony concentrations of 0.02%-0.10% and 0.04%-0.10% set forth in the claims of the '574 patent.

E

Finally, Inland asserts that it has demonstrated commercial success by showing that LTV, USX, and Inland all used antimony in their premium grade steels, which constituted more than 90% of a particular market segment for electrical steels between 1988 and 1991. To prove commercial success of the antimony-treated steel, Inland points to a pair of affidavits summarizing sales information received from LTV, USX, and Inland. While Inland's evidence shows some level of commercial success for the '574 patent process, we agree with the Board that the proffered commercial success, even when combined with other objective indicia of non-obviousness, is insufficient to overcome the strong prima facie obviousness case. See Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 719, 21 USPQ2d 1053, 1058 (Fed. Cir. 1991). Because the Board permissibly found a prima facie case of obviousness based on the combination of Rastogi and Irie, and because the Board properly concluded that Inland had not successfully rebutted that prima facie case, we sustain the Board's decision upholding the rejection of claims 9-17 of the '574 patent.

AFFIRMED.